OM-359 196 831Q

January 2004

Processes

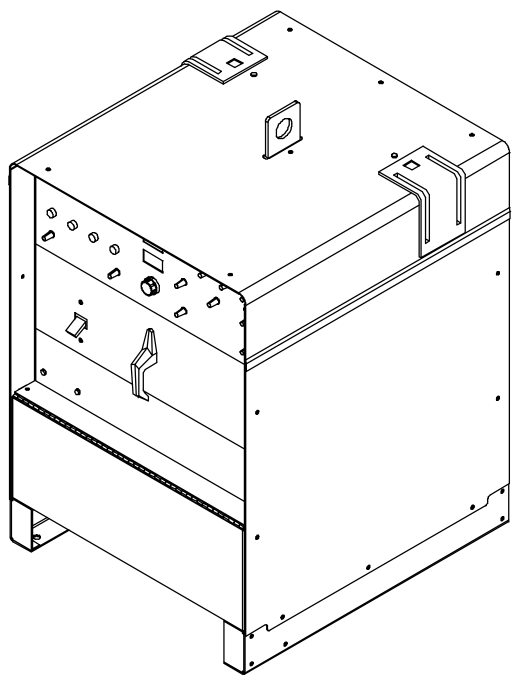
TIG (GTAW) Welding

Stick (SMAW) Welding

Description

Arc Welding Power Source

Syncrowave® 250 DX



And Non-CE Models

OWNER'S MANUAL

Visit our website at

www.MillerWelds.com

From Miller to You

Thank you and *congratulations* on choosing Miller. Now you can get the job done and get it done right. We know you don't have time to do it any other way.

That's why when Niels Miller first started building arc welders in 1929, he made sure his products offered long-lasting value and superior quality. Like you, his customers couldn't afford anything less. Miller products had to be more than the best they could be. They had to be the best you could buy.

Today, the people that build and sell Miller products continue the tradition. They're just as committed to providing equipment and service that meets the high standards of quality and value established in 1929.

This Owner's Manual is designed to help you get the most out of your Miller products. Please take time to read the Safety precautions. They will help you protect yourself against potential hazards on the worksite. We've made installation and operation quick and easy. With Miller you can count on years of reliable service with proper maintenance. And if for some reason the unit needs repair, there's a Troubleshooting section that will help you figure out what the problem is. The parts list will then help you to decide the exact part you may need to fix the problem. Warranty and service information for your particular model are also provided.

Miller is the first welding equipment manufacturer in the U.S.A. to be registered to the ISO 9001:2000 Quality System Standard.

Working as hard as you do − every power source from Miller is backed by the most hassle-free warranty in the business.



Miller Electric manufactures a full line of welders and welding related equipment. For information on other quality Miller products, contact your local Miller distributor to receive the latest full line catalog or individual catalog sheets. **To locate your nearest distributor or service agency call 1-800-4-A-Miller, or visit us at www.MillerWelds.com on the web.**

TABLE OF CONTENTS

TABLE OF CONTENTS

Declaration of Conformity For European Community (CE) Products

NOTE ☞	*This information is provided for units with CE certification (see rating label on unit.)*

Manufacturer's Name: Miller Electric Mfg. Co.

Manufacturer's Address: 1635 W. Spencer Street
Appleton, WI 54914 USA

Declares that the product: **Syncrowave® 250DX**

conforms to the following Directives and Standards:

Directives

Low Voltage Directive: 73/23/EEC

Machinery Directives: 89/392/EEC, 91/368/EEC, 93/C 133/04, 93/68/EEC

Electromagnetic Capability Directives: 89/336, 92/31/EEC

Standards

Safety Requirements for Arc Welding Equipment part 1: EN 60974-1: 1990

Arc Welding Equipment Part 1: Welding Power Sources: IEC 60974−1
(November 1997 − Draft revision)

Degrees of Protection provided by Enclosures (IP code): IEC 529: 1989

Insulation coordination for equipment within low-voltage systems:
Part 1: Principles, requirements and tests: IEC 664-1: 1992

Electromagnetic compatibility (EMC) Product standard for arc welding equipment:
EN50199: August 1995

European Contact: Mr. Danilo Fedolfi, Managing Director
ITW WELDING PRODUCTS ITALY S.r.l.
Via Privata Iseo 6/E
20098 San Giuliano
Milanese, Italy

Telephone: 39(02)98290-1
Fax: 39(02)98290-203

SECTION 1 − SAFETY PRECAUTIONS - READ BEFORE USING

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1-1. Symbol Usage



Means Warning! Watch Out! There are possible hazards with this procedure! The possible hazards are shown in the adjoining symbols.

▲ **Marks a special safety message.**

☞ *Means “Note”; not safety related.*



This group of symbols means Warning! Watch Out! possible ELECTRIC SHOCK, MOVING PARTS, and HOT PARTS hazards. Consult symbols and related instructions below for necessary actions to avoid the hazards.

1-2. Arc Welding Hazards

▲ **The symbols shown below are used throughout this manual to call attention to and identify possible hazards. When you see the symbol, watch out, and follow the related instructions to avoid the hazard. The safety information given below is only a summary of the more complete safety information found in the Safety Standards listed in Section 1-5. Read and follow all Safety Standards.**

▲ **Only qualified persons should install, operate, maintain, and repair this unit.**

▲ **During operation, keep everybody, especially children, away.**



ELECTRIC SHOCK can kill.

Touching live electrical parts can cause fatal shocks or severe burns. The electrode and work circuit is electrically live whenever the output is on. The input power circuit and machine internal circuits are also live when power is on. In semiautomatic or automatic wire welding, the wire, wire reel, drive roll housing, and all metal parts touching the welding wire are electrically live. Incorrectly installed or improperly grounded equipment is a hazard.

- Do not touch live electrical parts.
- Wear dry, hole-free insulating gloves and body protection.
- Insulate yourself from work and ground using dry insulating mats or covers big enough to prevent any physical contact with the work or ground.
- Do not use AC output in damp areas, if movement is confined, or if there is a danger of falling.
- Use AC output ONLY if required for the welding process.
- If AC output is required, use remote output control if present on unit.
- Disconnect input power or stop engine before installing or servicing this equipment. Lockout/tagout input power according to OSHA 29 CFR 1910.147 (see Safety Standards).
- Properly install and ground this equipment according to its Owner’s Manual and national, state, and local codes.
- Always verify the supply ground − check and be sure that input power cord ground wire is properly connected to ground terminal in disconnect box or that cord plug is connected to a properly grounded receptacle outlet.
- When making input connections, attach proper grounding conductor first − double-check connections.
- Frequently inspect input power cord for damage or bare wiring − replace cord immediately if damaged − bare wiring can kill.
- Turn off all equipment when not in use.
- Do not use worn, damaged, undersized, or poorly spliced cables.
- Do not drape cables over your body.
- If earth grounding of the workpiece is required, ground it directly with a separate cable.
- Do not touch electrode if you are in contact with the work, ground, or another electrode from a different machine.
- Use only well-maintained equipment. Repair or replace damaged parts at once. Maintain unit according to manual.
- Wear a safety harness if working above floor level.
- Keep all panels and covers securely in place.
- Clamp work cable with good metal-to-metal contact to workpiece or worktable as near the weld as practical.
- Insulate work clamp when not connected to workpiece to prevent contact with any metal object.
- Do not connect more than one electrode or work cable to any single weld output terminal.

SIGNIFICANT DC VOLTAGE exists after removal of input power on inverters.

- Turn Off inverter, disconnect input power, and discharge input capacitors according to instructions in Maintenance Section before touching any parts.



FUMES AND GASES can be hazardous.

Welding produces fumes and gases. Breathing these fumes and gases can be hazardous to your health.

- Keep your head out of the fumes. Do not breathe the fumes.
- If inside, ventilate the area and/or use exhaust at the arc to remove welding fumes and gases.
- If ventilation is poor, use an approved air-supplied respirator.
- Read the Material Safety Data Sheets (MSDSs) and the manufacturer's instructions for metals, consumables, coatings, cleaners, and degreasers.
- Work in a confined space only if it is well ventilated, or while wearing an air-supplied respirator. Always have a trained watch-person nearby. Welding fumes and gases can displace air and lower the oxygen level causing injury or death. Be sure the breathing air is safe.
- Do not weld in locations near degreasing, cleaning, or spraying operations. The heat and rays of the arc can react with vapors to form highly toxic and irritating gases.
- Do not weld on coated metals, such as galvanized, lead, or cadmium plated steel, unless the coating is removed from the weld area, the area is well ventilated, and if necessary, while wearing an air-supplied respirator. The coatings and any metals containing these elements can give off toxic fumes if welded.



ARC RAYS can burn eyes and skin.

Arc rays from the welding process produce intense visible and invisible (ultraviolet and infrared) rays that can burn eyes and skin. Sparks fly off from the weld.

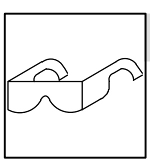
- Wear a welding helmet fitted with a proper shade of filter to protect your face and eyes when welding or watching (see ANSI Z49.1 and Z87.1 listed in Safety Standards).
- Wear approved safety glasses with side shields under your helmet.
- Use protective screens or barriers to protect others from flash and glare; warn others not to watch the arc.
- Wear protective clothing made from durable, flame-resistant material (leather and wool) and foot protection.



WELDING can cause fire or explosion.

Welding on closed containers, such as tanks, drums, or pipes, can cause them to blow up. Sparks can fly off from the welding arc. The flying sparks, hot workpiece, and hot equipment can cause fires and burns. Accidental contact of electrode to metal objects can cause sparks, explosion, overheating, or fire. Check and be sure the area is safe before doing any welding.

- Protect yourself and others from flying sparks and hot metal.
- Do not weld where flying sparks can strike flammable material.
- Remove all flammables within 35 ft (10.7 m) of the welding arc. If this is not possible, tightly cover them with approved covers.
- Be alert that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas.
- Watch for fire, and keep a fire extinguisher nearby.
- Be aware that welding on a ceiling, floor, bulkhead, or partition can cause fire on the hidden side.
- Do not weld on closed containers such as tanks, drums, or pipes, unless they are properly prepared according to AWS F4.1 (see Safety Standards).
- Connect work cable to the work as close to the welding area as practical to prevent welding current from traveling long, possibly unknown paths and causing electric shock and fire hazards.
- Do not use welder to thaw frozen pipes.
- Remove stick electrode from holder or cut off welding wire at contact tip when not in use.
- Wear oil-free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes, and a cap.
- Remove any combustibles, such as a butane lighter or matches, from your person before doing any welding.



FLYING METAL can injure eyes.

- Welding, chipping, wire brushing, and grinding cause sparks and flying metal. As welds cool, they can throw off slag.
- Wear approved safety glasses with side shields even under your welding helmet.



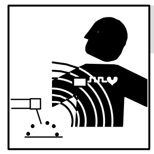
BUILDUP OF GAS can injure or kill.

- Shut off shielding gas supply when not in use.
- Always ventilate confined spaces or use approved air-supplied respirator.



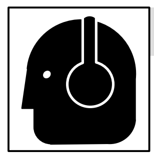
HOT PARTS can cause severe burns.

- Do not touch hot parts bare handed.
- Allow cooling period before working on gun or torch.



MAGNETIC FIELDS can affect pacemakers.

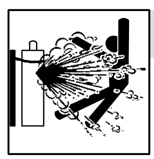
- Pacemaker wearers keep away.
- Wearers should consult their doctor before going near arc welding, gouging, or spot welding operations.



NOISE can damage hearing.

Noise from some processes or equipment can damage hearing.

- Wear approved ear protection if noise level is high.



CYLINDERS can explode if damaged.

Shielding gas cylinders contain gas under high pressure. If damaged, a cylinder can explode. Since gas cylinders are normally part of the welding process, be sure to treat them carefully.

- Protect compressed gas cylinders from excessive heat, mechanical shocks, slag, open flames, sparks, and arcs.
- Install cylinders in an upright position by securing to a stationary support or cylinder rack to prevent falling or tipping.
- Keep cylinders away from any welding or other electrical circuits.
- Never drape a welding torch over a gas cylinder.
- Never allow a welding electrode to touch any cylinder.
- Never weld on a pressurized cylinder − explosion will result.
- Use only correct shielding gas cylinders, regulators, hoses, and fittings designed for the specific application; maintain them and associated parts in good condition.
- Turn face away from valve outlet when opening cylinder valve.
- Keep protective cap in place over valve except when cylinder is in use or connected for use.
- Read and follow instructions on compressed gas cylinders, associated equipment, and CGA publication P-1 listed in Safety Standards.

1-3. Additional Symbols For Installation, Operation, And Maintenance



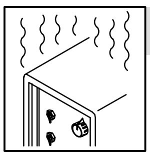
FIRE OR EXPLOSION hazard.

- Do not install or place unit on, over, or near combustible surfaces.
- Do not install unit near flammables.
- Do not overload building wiring − be sure power supply system is properly sized, rated, and protected to handle this unit.



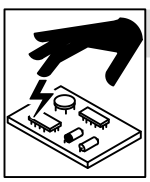
FALLING UNIT can cause injury.

- Use lifting eye to lift unit only, NOT running gear, gas cylinders, or any other accessories.
- Use equipment of adequate capacity to lift and support unit.
- If using lift forks to move unit, be sure forks are long enough to extend beyond opposite side of unit.



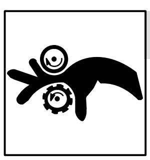
OVERUSE can cause OVERHEATING

- Allow cooling period; follow rated duty cycle.
- Reduce current or reduce duty cycle before starting to weld again.
- Do not block or filter airflow to unit.



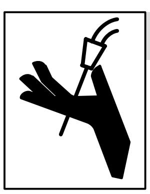
STATIC (ESD) can damage PC boards.

- Put on grounded wrist strap BEFORE handling boards or parts.
- Use proper static-proof bags and boxes to store, move, or ship PC boards.



MOVING PARTS can cause injury.

- Keep away from moving parts.
- Keep away from pinch points such as drive rolls.



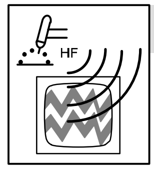
WELDING WIRE can cause injury.

- Do not press gun trigger until instructed to do so.
- Do not point gun toward any part of the body, other people, or any metal when threading welding wire.



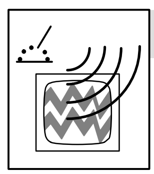
MOVING PARTS can cause injury.

- Keep away from moving parts such as fans.
- Keep all doors, panels, covers, and guards closed and securely in place.



H.F. RADIATION can cause interference.

- High-frequency (H.F.) can interfere with radio navigation, safety services, computers, and communications equipment.
- Have only qualified persons familiar with electronic equipment perform this installation.
- The user is responsible for having a qualified electrician promptly correct any interference problem resulting from the installation.
- If notified by the FCC about interference, stop using the equipment at once.
- Have the installation regularly checked and maintained.
- Keep high-frequency source doors and panels tightly shut, keep spark gaps at correct setting, and use grounding and shielding to minimize the possibility of interference.



ARC WELDING can cause interference.

- Electromagnetic energy can interfere with sensitive electronic equipment such as computers and computer-driven equipment such as robots.
- Be sure all equipment in the welding area is electromagnetically compatible.
- To reduce possible interference, keep weld cables as short as possible, close together, and down low, such as on the floor.
- Locate welding operation 100 meters from any sensitive electronic equipment.
- Be sure this welding machine is installed and grounded according to this manual.
- If interference still occurs, the user must take extra measures such as moving the welding machine, using shielded cables, using line filters, or shielding the work area.

1-4. California Proposition 65 Warnings

▲ **Welding or cutting equipment produces fumes or gases which contain chemicals known to the State of California to cause birth defects and, in some cases, cancer. (California Health & Safety Code Section 25249.5 et seq.)**

▲ **Battery posts, terminals and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. Wash hands after handling.**

For Gasoline Engines:

▲ **Engine exhaust contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.**

For Diesel Engines:

▲ **Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.**

1-5. Principal Safety Standards

Safety in Welding, Cutting, and Allied Processes, ANSI Standard Z49.1, from American Welding Society, 550 N.W. LeJeune Rd, Miami FL 33126 (phone: 305-443-9353, website: www.aws.org).

Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping, American Welding Society Standard AWS F4.1, from American Welding Society, 550 N.W. LeJeune Rd, Miami, FL 33126 (phone: 305-443-9353, website: www.aws.org).

National Electrical Code, NFPA Standard 70, from National Fire Protection Association, P.O. Box 9101, 1 Battery March Park, Quincy, MA 02269−9101 (phone: 617−770−3000, website: www.nfpa.org and www. sparky.org).

Safe Handling of Compressed Gases in Cylinders, CGA Pamphlet P-1, from Compressed Gas Association, 1735 Jefferson Davis Highway, Suite 1004, Arlington, VA 22202−4102 (phone: 703−412−0900, website: www.cganet.com).

Code for Safety in Welding and Cutting, CSA Standard W117.2, from Canadian Standards Association, Standards Sales, 178 Rexdale Boulevard, Rexdale, Ontario, Canada M9W 1R3 (phone: 800−463−6727 or in Toronto 416−747−4044, website: www.csa−international.org).

Practice For Occupational And Educational Eye And Face Protection, ANSI Standard Z87.1, from American National Standards Institute, 11 West 42nd Street, New York, NY 10036−8002 (phone: 212−642−4900, website: www.ansi.org).

Standard for Fire Prevention During Welding, Cutting, and Other Hot Work, NFPA Standard 51B, from National Fire Protection Association, P.O. Box 9101, 1 Battery March Park, Quincy, MA 02269−9101 (phone: 617−770−3000,website: www.nfpa.org and www. sparky.org).

OSHA, Occupational Safety and Health Standards for General Industry, Title 29, Code of Federal Regulations (CFR), Part 1910, Subpart Q, and Part 1926, Subpart J, from U.S. Government Printing Office, Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250 (there are 10 Regional Offices−−phone for Region 5, Chicago, is 312−353−2220,website: www.osha.gov).

1-6. EMF Information

Considerations About Welding And The Effects Of Low Frequency Electric And Magnetic Fields

Welding current, as it flows through welding cables, will cause electromagnetic fields. There has been and still is some concern about such fields. However, after examining more than 500 studies spanning 17 years of research, a special blue ribbon committee of the National Research Council concluded that: “The body of evidence, in the committee's judgment, has not demonstrated that exposure to power-frequency electric and magnetic fields is a human-health hazard.” However, studies are still going forth and evidence continues to be examined. Until the final conclusions of the research are reached, you may wish to minimize your exposure to electromagnetic fields when welding or cutting.

To reduce magnetic fields in the workplace, use the following procedures:

1. Keep cables close together by twisting or taping them.
2. Arrange cables to one side and away from the operator.
3. Do not coil or drape cables around your body.
4. Keep welding power source and cables as far away from operator as practical.
5. Connect work clamp to workpiece as close to the weld as possible.

About Pacemakers:

Pacemaker wearers consult your doctor first. If cleared by your doctor, then following the above procedures is recommended.

SECTION 2 − CONSIGNES DE SÉCURITÉ − À LIRE AVANT UTILISATION

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2-1. Signification des symboles



Signifie « Mise en garde. Faire preuve de vigilance. » Cette procédure présente des risques identifiés par les symboles adjacents aux directives.

▲ **Identifie un message de sécurité particulier.**

☞ *Signifie « NOTA » ; n’est pas relatif à la sécurité.*



Ce groupe de symboles signifie « Mise en garde. Faire preuve de vigilance. » Il y a des dangers liés aux CHOCS ÉLECTRIQUES, aux PIÈCES EN MOUVEMENT et aux PIÈCES CHAUDES. Se reporter aux symboles et aux directives ci-dessous afin de connaître les mesures à prendre pour éviter tout danger.

2-2. Dangers relatifs au soudage à l’arc

▲ **Les symboles ci-après sont utilisés tout au long du présent manuel pour attirer l’attention sur les dangers potentiels et les identifier. Lorsqu’on voit un symbole, faire preuve de vigilance et suivre les directives mentionnées afin d’éviter tout danger. Les consignes de sécurité énoncées ci-après ne font que résumer le contenu des normes de sécurité mentionnées à la section 2-4. Lire et respecter toutes ces normes.**

▲ **L’installation, l’utilisation, l’entretien et les réparations ne doivent être confiés qu’à des personnes qualifiées.**

▲ **Pendant l’utilisation de l’appareil, tenir à l’écart toute personne, en particulier les enfants.**



LES DÉCHARGES ÉLECTRIQUES peuvent être mortelles.

Un simple contact avec des pièces sous tension peut causer une électrocution ou des blessures graves. L’électrode et le circuit de soudage sont sous tension dès que l’appareil est en fonctionnement. Le circuit d’entrée et les circuits internes de l’appareil sont également sous tension. En soudage semi−automatique ou automatique, le fil, le dévidoir, le logement des galets d’entraînement et les pièces métalliques en contact avec le fil de soudage sont sous tension. Tout matériel mal installé ou mal mis à la terre présente un danger.

- Ne jamais toucher aux pièces électriques sous tension.
- Porter des gants et des vêtements de protection secs et exempts de trous.
- S’isoler de la pièce et de la terre au moyen de tapis ou autres dispositifs isolants suffisamment grands pour empêcher tout contact physique avec la pièce ou la terre.
- Ne pas se servir d’une source de courant alternatif dans les zones humides, les endroits confinés ou là où on risque de tomber.
- Ne se servir d’une source de courant alternatif QUE si le procédé de soudage l’exige.
- Si l’utilisation d’une source de courant alternatif s’avère nécessaire, se servir de la fonction de télécommande si l’appareil en est équipé.
- Couper l’alimentation ou arrêter le moteur avant de procéder à l’installation, à la réparation ou à l’entretien de l’appareil. Couper/étiqueter l’alimentation selon la norme OSHA 29 CFR 1910.147 (voir les normes de sécurité).
- Installer et mettre à la terre correctement l’appareil conformément à son manuel d’utilisation et aux codes nationaux, provinciaux et municipaux.
- Toujours vérifier la terre du cordon d’alimentation − Vérifier et s’assurer que le fil de terre du cordon d’alimentation est bien raccordé à la borne de terre du sectionneur ou que la fiche du cordon est raccordée à une prise correctement mise à la terre.
- Pour exécuter les branchements d’entrée, fixer d’abord le conducteur de mise à la terre adéquat et contre−vérifier les connexions.
- Vérifier fréquemment le cordon d’alimentation et s’assurer qu’il n’est ni endommagé ni dénudé ; le remplacer immédiatement s’il est endommagé − tout câble dénudé peut causer une électrocution.
- Mettre l’appareil hors tension quand on ne l’utilise pas.
- Ne pas utiliser de câbles usés, endommagés, de calibre insuffisant ou mal épissés.
- Ne pas s’enrouler les câbles autour du corps.
- Si la pièce soudée doit être mise à la terre, le faire directement avec un câble distinct.
- Ne pas toucher l’électrode quand on est en contact avec la pièce, la terre ou une électrode d’une autre machine.
- N’utiliser que du matériel en bon état. Réparer ou remplacer sur−le−champ les pièces endommagées. Entretenir l’appareil conformément au présent manuel.
- Porter un harnais de sécurité quand on travaille en hauteur.
- Maintenir solidement en place tous les panneaux et capots.
- Fixer le câble de retour de façon à obtenir un bon contact métal sur métal avec la pièce à souder ou la table de travail, le plus près possible de la soudure.
- Ne pas connecter plus d’une électrode ou plus d’un câble de masse à un même terminal de sortie.

Il subsiste un COURANT CONTINU IMPORTANT dans les convertisseurs après la suppression de l’alimentation électrique.

- Arrêter les convertisseurs, débrancher le courant électrique et décharger les condensateurs d’alimentation selon les instructions énoncées à la section Entretien avant de toucher les pièces.



LES FUMÉES ET LES GAZ peuvent être dangereux.

Le soudage génère des fumées et des gaz dont l’inhalation peut être dangereuse pour la santé.

- Se tenir à distance des fumées et ne pas les inhaler.
- À l’intérieur, ventiler la zone et/ou utiliser un dispositif d’aspiration au niveau de l’arc pour l’évacuation des fumées et des gaz de soudage.
- Si la ventilation est insuffisante, utiliser un respirateur à adduction d’air agréé.
- Lire les fiches techniques de santé−sécurité (FTSS) et les instructions du fabricant concernant les métaux, les consommables, les revêtements, les nettoyants et les dégraisseurs.
- Ne travailler dans un espace clos que s’il est bien ventilé ou porter un respirateur à adduction d’air. Demander toujours à un surveillant dûment formé de se tenir à proximité. Des fumées et des gaz de soudage peuvent se substituer à l’air, abaisser la teneur en oxygène et causer des lésions ou des accidents mortels. S’assurer que l’air est respirable.
- Ne pas souder à proximité d’opérations de dégraissage, de nettoyage ou de pulvérisation. La chaleur et les rayons de l’arc peuvent réagir en présence de vapeurs et former des gaz hautement toxiques et irritants.
- Ne pas souder de métaux munis d’un revêtement, tels que la tôle d’acier galvanisée, plombée ou cadmiée, à moins que le revêtement n’ait été enlevé dans la zone de soudage, que l’endroit soit bien ventilé, et si nécessaire, porter un respirateur à adduction d’air. Les revêtements et tous les métaux renfermant ces éléments peuvent dégager des fumées toxiques lorsqu’on les soude.

Revenez à la table des matières



LES RAYONS DE L’ARC peuvent causer des brûlures oculaires et cutanées.

Le rayonnement de l’arc génère des rayons visibles et invisibles intenses (ultraviolets et infrarouges) susceptibles de causer des brûlures oculaires et cutanées. Des étincelles sont projetées pendant le soudage.

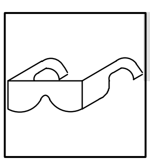
- Porter un masque de soudage muni d’un filtre de la nuance adéquate pour se protéger le visage et les yeux pendant le soudage ou pour regarder (voir les normes de sécurité ANSI Z49.1 et Z87.1).
- Porter des lunettes de sécurité à écrans latéraux sous le masque.
- Utiliser des écrans ou des barrières pour protéger les tiers de l’éclat éblouissant ou aveuglant de l’arc ; leur demander de ne pas regarder l’arc.
- Porter des vêtements de protection en matière durable et ignifuge (cuir ou laine) et des chaussures de sécurité.



LE SOUDAGE peut causer un incendie ou une explosion.

Le soudage effectué sur des récipients fermés tels que des réservoirs, des fûts ou des conduites peut causer leur éclatement. Des étincelles peuvent être projetées de l’arc de soudure. La projection d’étincelles, les pièces chaudes et les équipements chauds peuvent causer des incendies et des brûlures. Le contact accidentel de l’électrode avec tout objet métallique peut causer des étincelles, une explosion, un surchauffement ou un incendie. Avant de commencer le soudage, vérifier et s’assurer que l’endroit ne présente pas de danger.

- Se protéger et protéger les tiers de la projection d’étincelles et de métal chaud.
- Ne pas souder à un endroit où des étincelles peuvent tomber sur des substances inflammables.
- Placer toutes les substances inflammables à une distance de 10,7 m de l’arc de soudage. En cas d’impossibilité, les recouvrir soigneusement avec des protections agréées.
- Des étincelles et des matières en fusion peuvent facilement passer même par des fissures et des ouvertures de petites dimensions.
- Surveiller tout déclenchement d’incendie et tenir un extincteur à proximité.
- Le soudage effectué sur un plafond, un plancher, une paroi ou une cloison peut déclencher un incendie de l’autre côté.
- Ne pas souder des récipients fermés tels que des réservoirs, des fûts ou des conduites, à moins qu’ils n’aient été préparés conformément à l’AWS F4.1 (voir les normes de sécurité).
- Brancher le câble sur la pièce le plus près possible de la zone de soudage pour éviter que le courant ne circule sur une longue distance, par des chemins inconnus, et ne cause des risques d’électrocution et d’incendie.
- Ne pas utiliser le poste de soudage pour dégeler des conduites gelées.
- En cas de non utilisation, enlever la baguette d’électrode du porte−électrode ou couper le fil au raz du tube−contact.
- Porter des vêtements de protection exempts d’huile tels que des gants en cuir, une chemise en tissu épais, des pantalons sans revers, des chaussures montantes et un masque.
- Avant de souder, retirer tout produit combustible de ses poches, tel qu’un briquet au butane ou des allumettes.



LES PARTICULES PROJETÉES peuvent blesser les yeux.

- Le soudage, le burinage, le passage de la pièce à la brosse métallique et le meulage provoquent l’émission d’étincelles et de particules métalliques. Pendant leur refroidissement, les soudures risquent de projeter du laitier.
- Porter des lunettes de sécurité à écrans latéraux agréés, même sous le masque de soudage.



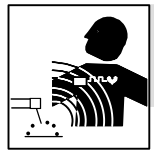
LES ACCUMULATIONS DE GAZ peuvent causer des blessures ou même la mort.

- Couper l’alimentation en gaz protecteur en cas de non utilisation.
- Veiller toujours à bien ventiler les espaces confinés ou porter un respirateur à adduction d’air agréé.



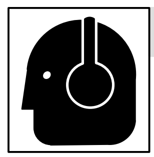
LES PIÈCES CHAUDES peuvent causer des brûlures graves.

- Ne pas toucher les pièces chaudes à main nue.
- Prévoir une période de refroidissement avant d’utiliser le pistolet ou la torche.



LES CHAMPS MAGNÉTIQUES peuvent perturber le fonctionnement des stimulateurs cardiaques.

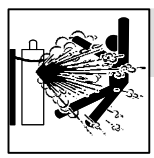
- Les personnes qui portent un stimulateur cardiaque doivent se tenir à distance.
- Ils doivent consulter leur médecin avant de s’approcher d’un lieu où on exécute des opérations de soudage à l’arc, de gougeage ou de soudage par points.



LE BRUIT peut affecter l’ouïe.

Le bruit de certains processus et équipements peut affecter l’ouïe.

- Porter des protecteurs d’oreille agréés si le niveau sonore est trop élevé.



Les BOUTEILLES endommagées peuvent exploser.

Les bouteilles de gaz protecteur contiennent du gaz sous haute pression. Toute bouteille endommagée peut exploser. Comme les bouteilles de gaz font normalement partie du procédé de soudage, les manipuler avec précaution.

- Protéger les bouteilles de gaz comprimé de la chaleur excessive, des chocs mécaniques, du laitier, des flammes nues, des étincelles et des arcs.
- Placer les bouteilles debout en les fixant dans un support stationnaire ou dans un porte−bouteilles pour les empêcher de tomber ou de se renverser.
- Tenir les bouteilles éloignées des circuits de soudage ou autres circuits électriques.
- Ne jamais poser une torche de soudage sur une bouteille de gaz.
- Ne jamais mettre une électrode de soudage en contact avec une bouteille de gaz.
- Ne jamais souder une bouteille contenant du gaz sous pression − elle risquerait d’exploser.
- N’utiliser que les bouteilles de gaz protecteur, régulateurs, tuyaux et raccords adéquats pour l’application envisagée ; les maintenir en bon état, ainsi que les pièces connexes.
- Détourner la tête lorsqu’on ouvre la soupape d’une bouteille.
- Laisser le capuchon protecteur sur la soupape, sauf en cas d’utilisation ou de branchement de la bouteille
- Lire et suivre les instructions concernant les bouteilles de gaz comprimé, les équipements associés et les publications P−1 de la CGA, mentionnées dans les normes de sécurité.

2-3. Autres symboles relatifs à l'installation, au fonctionnement et à l'entretien de l'appareil.



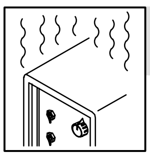
Risque D'INCENDIE OU D'EXPLOSION

- Ne pas placer l'appareil sur une surface inflammable, ni au−dessus ou à proximité d'elle.
- Ne pas installer l'appareil à proximité de produits inflammables.
- Ne pas surcharger l'installation électrique − s'assurer que l'alimentation est correctement dimensionnée et protégée avant de mettre l'appareil en service.



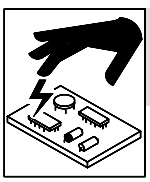
LA CHUTE DE L'APPAREIL peut blesser.

- N'utiliser que l'anneau de levage pour lever l'appareil. NE PAS utiliser le chariot, les bouteilles de gaz ou tout autre accessoire.
- Utiliser un engin de capacité adéquate pour lever l'appareil.
- Si on utilise un chariot élévateur pour déplacer l'unité, s'assurer que les fourches sont suffisamment longues pour dépasser du côté opposé de l'appareil.



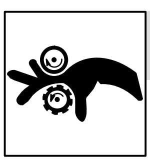
L'EMPLOI EXCESSIF peut FAIRE SURCHAUFFER L'ÉQUIPEMENT.

- Prévoir une période de refroidissement ; respecter le cycle opératoire nominal.
- Réduire le courant ou le cycle opératoire avant de reprendre le soudage.
- Ne pas obstruer les orifices ou filtrer l'alimentation en air du poste.



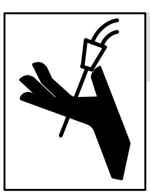
LES CHARGES ÉLECTROSTATIQUES peuvent endommager les circuits imprimés.

- Mettre un bracelet antistatique AVANT de manipuler des cartes ou des pièces.
- Utiliser des pochettes et des boîtes antistatiques pour stocker, déplacer ou expédier des cartes de circuits imprimés.



LES PIÈCES MOBILES peuvent causer des blessures.

- Se tenir à l'écart des pièces mobiles.
- Se tenir à l'écart des points de coincement tels que les dévidoirs.



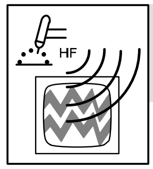
LES FILS DE SOUDAGE peuvent causer des blessures.

- Ne pas appuyer sur la gâchette avant d'en avoir reçu l'instruction.
- Ne pas diriger le pistolet vers soi, vers d'autres personnes ou vers toute pièce mécanique en engageant le fil de soudage.



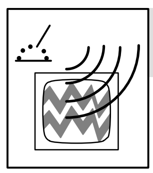
LES ORGANES MOBILES peuvent causer des blessures.

- Se tenir à l'écart des organes mobiles comme les ventilateurs.
- Maintenir fermés et bien fixés les portes, panneaux, recouvrements et dispositifs de protection.



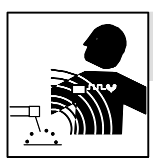
LE RAYONNEMENT HAUTE FRÉQUENCE (H. F.) risque de causer des interférences.

- Le rayonnement haute fréquence peut causer des interférences avec les équipements de radio-navigation et de communication, les services de sécurité et les ordinateurs.
- Ne demander qu'à des personnes qualifiées familiarisées avec les équipements électroniques de faire fonctionner l'installation.
- L'utilisateur est tenu de faire corriger rapidement par un électricien qualifié les interférences causées par l'installation.
- Si la Federal Communications Commission signale des interférences, arrêter immédiatement l'appareil.
- Faire régulièrement contrôler et entretenir l'installation.
- Maintenir soigneusement fermés les panneaux et les portes des sources de haute fréquence, maintenir le jeu d'éclatement au réglage adéquat et utiliser une terre et un blindage pour réduire les interférences éventuelles.



LE SOUDAGE À L'ARC peut causer des interférences.

- L'énergie électromagnétique peut causer des interférences avec l'équipement électronique sensible tel que les ordinateurs et l'équipement commandé par ordinateur tel que les robots.
- Veiller à ce que tout l'équipement de la zone de soudage soit compatible au point de vue électromagnétique.
- Pour réduire la possibilité d'interférence, maintenir les câbles de soudage aussi courts que possible, les grouper, et les poser aussi bas que possible (par ex. : à terre).
- Veiller à souder à une distance de 100 mètres de tout équipement électronique sensible.
- Veiller à ce que le poste de soudage soit posé et mis à la terre conformément au présent manuel.
- En cas d'interférences après exécution des directives précédentes, il incombe à l'utilisateur de prendre des mesures supplémentaires telles que le déplacement du poste, l'utilisation de câbles blindés, l'utilisation de filtres de ligne ou la pose de protecteurs dans la zone de travail.



LES CHAMPS MAGNÉTIQUES peuvent affecter les stimulateurs cardiaques.

- Porteurs de stimulateur cardiaque, restez à distance.
- Les porteurs d'un stimulateur cardiaque doivent d'abord consulter leur médecin avant de s'approcher des opérations de soudage à l'arc, de gougeage ou de soudage par points.

2-4. Principales normes de sécurité

Safety in Welding, Cutting, and Allied Processes, norme ANSI Z49.1, de l'American Welding Society, 550 N.W. LeJeune Rd, Miami FL 33126 (téléphone : (305) 443−9353, site Web : www.aws.org).

Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping, norme American Welding Society AWS F4.1, de l'American Welding Society, 550 N.W. LeJeune Rd, Miami, FL 33126 (téléphone : (305) 443−9353, site Web : www.aws.org).

National Electrical Code, norme NFPA 70, de la National Fire Protection Association, P.O. Box 9101, 1 Battery March Park, Quincy, MA 02269−9101 (téléphone : (617) 770−3000, sites Web : www.nfpa.org et www.sparky.org).

Safe Handling of Compressed Gases in Cylinders, brochure CGA P−1, de la Compressed Gas Association, 1735 Jefferson Davis Highway, Suite 1004, Arlington, VA 22202−4102 (téléphone : (703) 412−0900, site Web : www.cganet.com).

Code for Safety in Welding and Cutting, norme CSA W117.2, de la Canadian Standards Association, Standards Sales, 178 boulevard Rexdale, Rexdale (Ontario) Canada M9W 1R3 (téléphone : (800) 463−6727 ou à Toronto : (416) 747−4044, site Web : www.csa−international.org).

Practice For Occupational And Educational Eye And Face Protection, norme ANSI Z87.1, de l'American National Standards Institute, 11 West 42nd Street, New York, NY 10036−8002 (téléphone : (212) 642−4900, site Web : www.ansi.org).

Standard for Fire Prevention During Welding, Cutting, and Other Hot Work, norme NFPA 51B, de la National Fire Protection Association, P.O. Box 9101, 1 Battery March Park, Quincy, MA 02269−9101 (téléphone : (617) 770−3000, site Web : www.nfpa.org et www.sparky.org).

OSHA, Occupational Safety and Health Standards for General Industry, Title 29, Code of Federal Regulations (CFR), Part 1910, Subpart Q, and Part 1926, Subpart J, de l'U.S. Government Printing Office, Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250 (il y a 10 bureaux régionaux − Téléphone pour la Région 5, Chicago : (312) 353−2220, site Web : www.osha.gov).

2-5. Information sur les champs électromagnétiques

Données sur le soudage électrique et les effets des champs magnétiques basse fréquence sur l'organisme

En parcourant les câbles de soudage, le courant crée des champs électromagnétiques. Les effets potentiels de tels champs restent préoccupants. Cependant, après avoir examiné plus de 500 études qui ont été faites pendant une période de recherche de 17 ans, un comité de spécialistes du National Research Council a conclu : « L'accumulation de preuves n'a pas démontré que l'exposition aux champs magnétiques et aux champs électriques à haute fréquence constitue un risque pour la santé humaine ». Toutefois, les études et l'examen des preuves se poursuivent. En attendant les conclusions finales de la recherche, il serait souhaitable de réduire l'exposition aux champs électromagnétiques pendant le soudage ou le coupage.

Afin de réduire les champs électromagnétiques en milieu de travail, respecter les consignes suivantes :

1. Garder les câbles ensemble en les torsadant ou en les fixant avec du ruban adhésif.
2. Mettre tous les câbles du côté opposé à l'opérateur.
3. Ne pas s'enrouler les câbles autour du corps.
4. Garder le poste de soudage et les câbles le plus loin possible de soi.
5. Placer la pince de masse le plus près possible de la zone de soudage.

Consignes relatives aux stimulateurs cardiaques :

Les personnes qui portent un stimulateur cardiaque doivent avant tout consulter leur médecin. Si ce dernier les déclare aptes, il leur est recommandé de respecter les consignes ci-dessus.

Revenez à la table des matières

SECTION 3 − DEFINITIONS

3-1. Warning Label Definitions

Warning! Watch Out! There are possible hazards as shown by the symbols.

1 Electric shock from welding electrode or wiring can kill.

1.1 Wear dry insulating gloves. Do not touch electrode with bare hand. Do not wear wet or damaged gloves.

1.2 Protect yourself from electric shock by insulating yourself from work and ground.

1.3 Disconnect input plug or power before working on machine.

2 Breathing welding fumes can be hazardous to your health.

2.1 Keep your head out of the fumes.

2.2 Use forced ventilation or local exhaust to remove the fumes.

2.3 Use ventilating fan to remove fumes.

3 Welding sparks can cause explosion or fire.

3.1 Keep flammables away from welding. Do not weld near flammables.

3.2 Welding sparks can cause fires. Have a fire extinguisher nearby, and have a watchperson ready to use it.

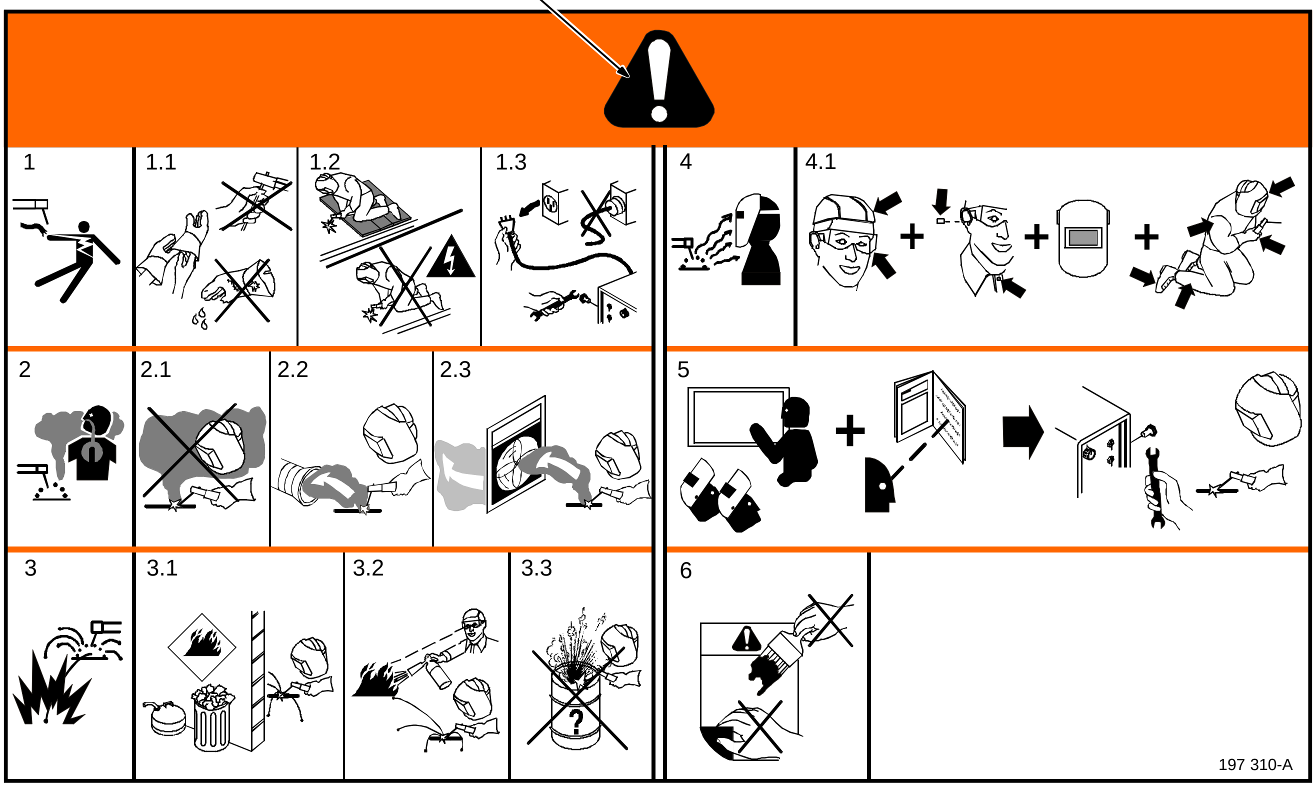
3.3 Do not weld on drums or any closed containers.

4 Arc rays can burn eyes and injure skin.

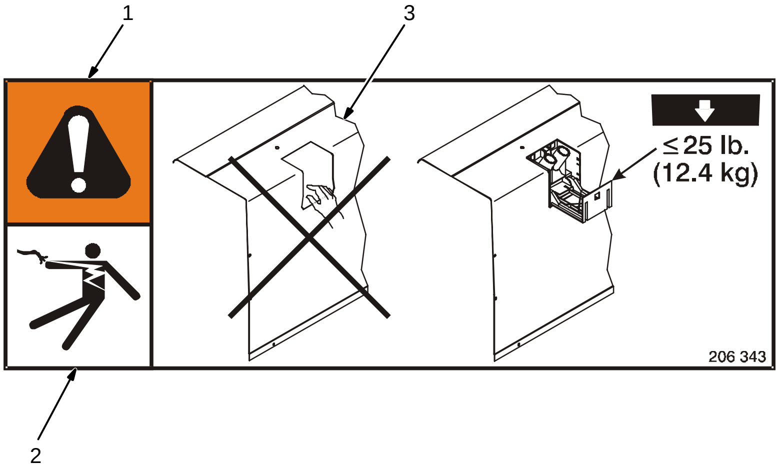
4.1 Wear hat and safety glasses. Use ear protection and button shirt collar. Use welding helmet with correct shade of filter. Wear complete body protection.

5 Become trained and read the instructions before working on the machine or welding.

6 Do not remove or paint over (cover) the label.



3-2. Torch/Cable Holder Label



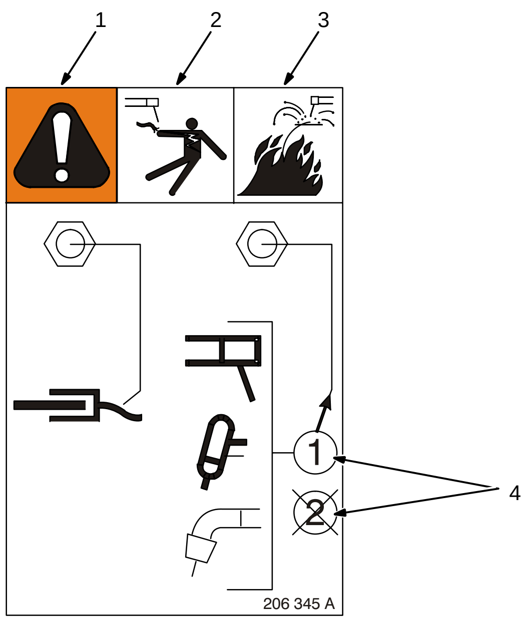
1 Warning! Watch Out! There are possible hazards as shown by the symbols.

2 Electric shock from wiring can kill.

3 Do not operate unit or reach inside when torch/cable holder is removed.

4 Do not exceed 25 lb (12.4 kg) maximum load on gun/cable holder or holder may break.

3-3. Weld Cable Connection Label



1 Warning! Watch Out! There are possible hazards as shown by the symbols.

2 Electric shock from welding electrode or wiring can kill.

3 Welding sparks or arcing from unused electrode can cause explosion or fire.

4 Do not connect more than one electrode cable to any single weld output terminal. Disconnect cables for process not in use. Have only one welding circuit (process) connected at any given time — never two.

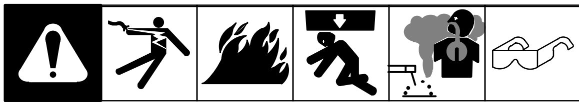
3-4. Symbols And Definitions

NOTE	*Some symbols are found only on CE products.*

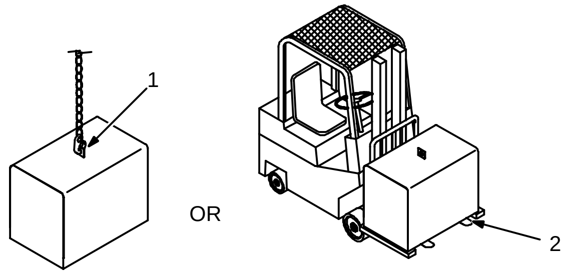
Symbol	Definition	Symbol	Definition	Symbol	Definition	Symbol	Definition
A	Amperes		Panel−Local		Gas Tungsten Arc Welding (GTAW)		Shielded Metal Arc Welding (SMAW)
V	Volts		Do Not Switch While Welding		Arc Force (DIG)	% A	Background Amps
	Output		Circuit Breaker		Remote		Temperature
	Protective Earth (Ground)		Alternating Current	HF	High Frequency - Start	V	Input
t2	Postflow Timer	t1	Preflow Timer	HF	High Frequency - Continuous		
	Gas (Supply)		Gas Input		Gas Output		Increase/Decrease Of Quantity
I	On	O	Off	%	Percent		Direct Current
+ −	Balance Control		Maximum Cleaning		Maximum Penetration	+	Electrode Positive
−	Electrode Negative	t	Final Slope		Meter	1	Single-Phase
U_0	Rated No Load Voltage (Average)	U_1	Primary Voltage	U_2	Conventional Load Voltage		Line Connection
I_1	Primary Current	I_2	Rated Welding Current	X	Duty Cycle		Single-Phase Combined AC/DC Power Source
IP	Degree Of Protection	I_{1eff}	Maximum Effective Supply Current	I_{1max}	Rated Maximum Supply Current	Hz	Hertz
	Electrode		Work		Thickness Gauge		Spark Gap
S	Seconds	A	Final Amperage	t	Initial Time	A	Initial Amperage
% t	Pulse Percent On Time	●●●● t	Spot Time		Lift-Arc™	4T	4 Step Trigger Operation Sequence
	Trigger Hold		Pulser On-Off	f	Pulse Frequency		

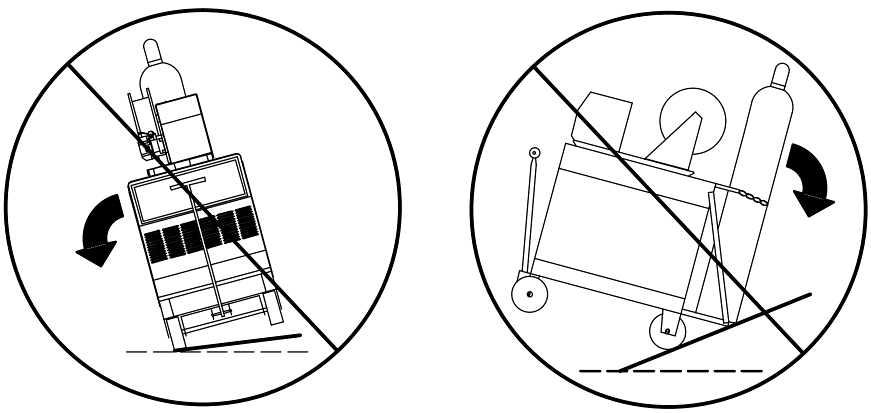
SECTION 4 − INSTALLATION

4-1. Selecting A Location

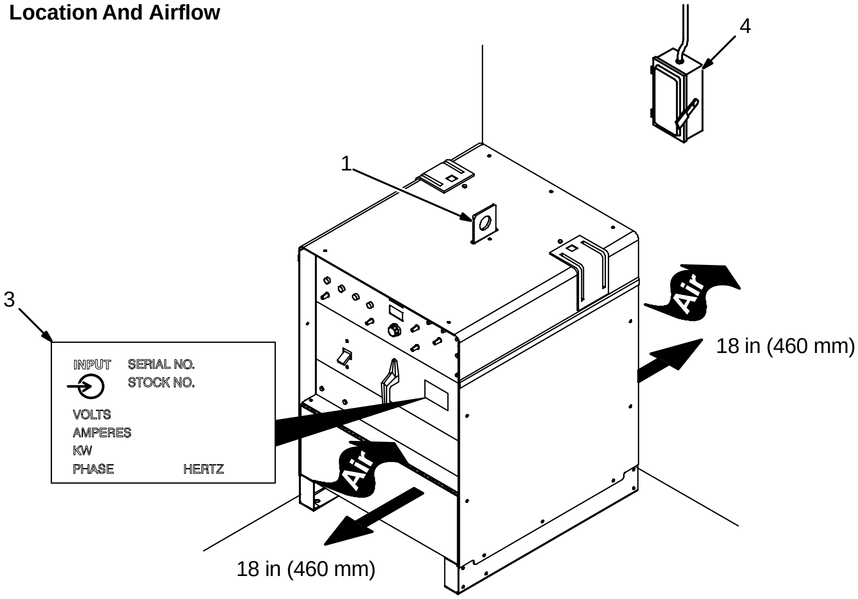


Movement





Location And Airflow



▲ **Falling Unit Can Cause Injury.**

- Use lifting eye to lift unit only, NOT running gear, gas cylinders, or any other accessories.
- Use equipment of adequate capacity to lift and support unit.
- If using lift forks to move unit, be sure forks are long enough to extend beyond opposite side of unit.

1 Lifting Eye

2 Lifting Forks

Use lifting eye or lifting forks to move unit.

If using lifting forks, extend forks beyond opposite side of unit.

3 Rating Label

Use rating label to determine input power needs.

4 Line Disconnect Device

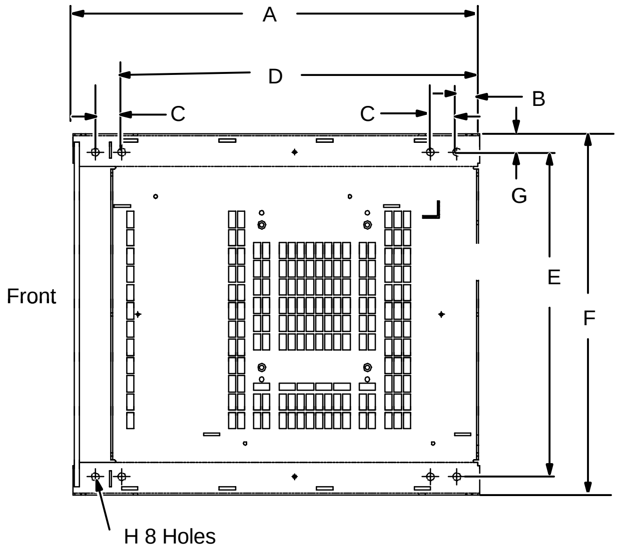
Locate unit near correct input power supply.

▲ **Special installation may be required where gasoline or volatile liquids are present − see NEC Article 511 or CEC Section 20.**

▲ **Be careful when placing or moving unit over uneven surfaces.**

Ref. ST-117 264-C / ST-802 455-C

4-2. Dimensions And Weights



Dimensions	
Height	33-1/4 in (845 mm)
Width	22-1/2 in (572 mm)
Length	25 in (635 mm)
A	25 in (635 mm)
B	1-25/64 in (35 mm)
C	1-5/8 in (41 mm)
D	20-5/8 in (524 mm)
E	19-15/16 (506 mm)
F	22-1/4 (565 mm)
G	1-5/32 in (30 mm)
H	1/2 in (13 mm) Dia
Weight	
389 lbs (176 kg)	

4-3. Specifications

Rated Welding Output	PFC**	Amperes Input at AC Balanced Rated Load Output, 60 Hz, Single-Phase				KVA	KW	Amperage Range	Max OCV
		200V	230V	460V	575V				
NEMA Class I (40) − 200 Amperes, 28 Volts AC, 60% Duty Cycle	No PFC	88 *3.3	77 *2.8	38 *1.5	31 *1.1	17.6 *.59	8.6 *.29	5 − 310A	80V
NEMA Class I (40) − 200 Amperes, 28 Volts AC, 60% Duty Cycle	With PFC	60 *55.3	52 *49.5	26 *24.5	21 *19.6	12.06 *11.2	8.11 *.39	5 − 310A	80V
NEMA Class II (40) − 250 Amperes, 30 Volts AC, 40% Duty Cycle	No PFC	110 *3.3	96 *2.8	48 *1.5	38 *1.1	21.98 *.59	11.76 *.29	5 − 310A	80V
NEMA Class II (40) − 250 Amperes, 30 Volts AC, 40% Duty Cycle	With PFC	82 *55.3	71 *49.5	35 *24.5	28 *19.6	16.32 *11.2	11.81 *1.93	5 − 310A	80V

*While idling

**Power Factor Correction

3-5. Specifications(continued)

Rated Welding Output	PFC**	Amperes Input at AC Balanced Rated Load Output, 50/60 Hz, Single-Phase				KVA	KW	Amperage Range	Max OCV
		220V	400V	440V	520V				
NEMA Class I (40) − 200 Amperes, 28 Volts AC, 60% Duty Cycle	No PFC	82 *3.0	45 *1.6	41 *1.4	35 *1.2	17.6 *.59	8.6 *.29	5 − 310A	80V
NEMA Class I (40) − 200 Amperes, 28 Volts AC, 60% Duty Cycle	With PFC	61 *45.9	34 *25.1	31 *22.8	26 *23.2	12.06 *11.2	8.11 *.39	5 − 310A	80V
NEMA Class II (40) − 250 Amperes, 30 Volts AC, 40% Duty Cycle	No PFC	100 *3.0	55 *1.6	50 *1.4	42 *1.2	21.98 *.59	11.76 *.29	5 − 310A	80V
NEMA Class II (40) − 250 Amperes, 30 Volts AC, 40% Duty Cycle	With PFC	81 *45.9	44 *25.1	40 *22.8	34 *23.2	16.32 *11.2	11.81 *1.93	5 − 310A	80V

*While idling

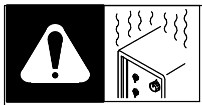
**Power Factor Correction

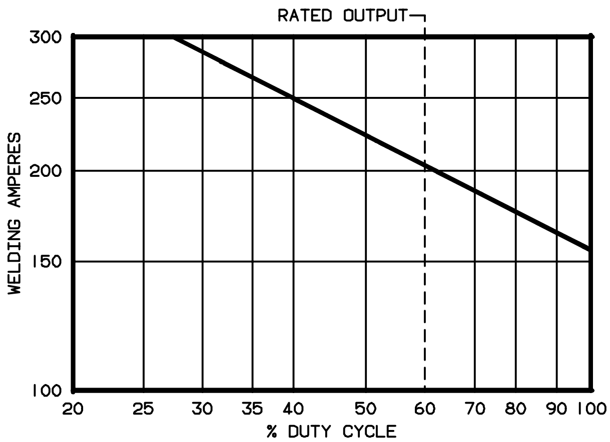
Rated Welding Output	PFC**	Amperes Input at AC Balanced Rated Load Output, 50 Hz, Single-Phase				KVA	KW	Amperage Range	Max OCV
		200V	230V	460V	575V				
NEMA Class I (40) − 175 Amperes, 27 Volts AC, 60% Duty Cycle	No PFC	80 *3.3	69 *2.8	35 *1.5	28 *1.1	15.9 *.59	7.4 *.29	5 − 310A	80V
NEMA Class I (40) − 175 Amperes, 27 Volts AC, 60% Duty Cycle	With PFC	52 *55.3	45 *49.5	22 *24.5	18 *19.6	10.3 *11.2	7.3 *.39	5 − 310A	80V
NEMA Class II (40) − 225 Amperes, 29 Volts AC, 40% Duty Cycle	No PFC	101 *3.3	88 *2.8	44 *1.5	35 *1.1	20.2 *.59	10.2 *.29	5 − 310A	80V
NEMA Class II (40) − 225 Amperes, 29 Volts AC, 40% Duty Cycle	With PFC	74 *55.3	64 *49.5	32 *24.5	26 *19.6	14.7 *11.2	10.1 *1.93	5 − 310A	80V

*While idling

**Power Factor Correction

4-4. Duty Cycle And Overheating



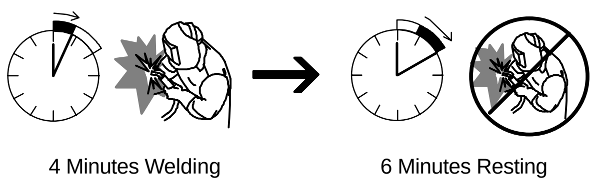


Duty Cycle is the percentage of 10 minutes that the unit can weld at rated load without overheating.

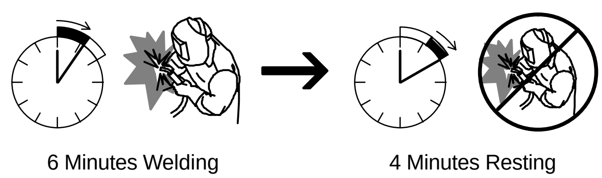
If unit overheats, output stops, front panel voltmeter/ammeter displays a HLP3 or HLP5 message (see Section 6-4), and cooling fans run. Wait fifteen minutes for unit to cool. Reduce amperage or duty cycle before welding.

▲ **Exceeding duty cycle can damage unit and void warranty.**

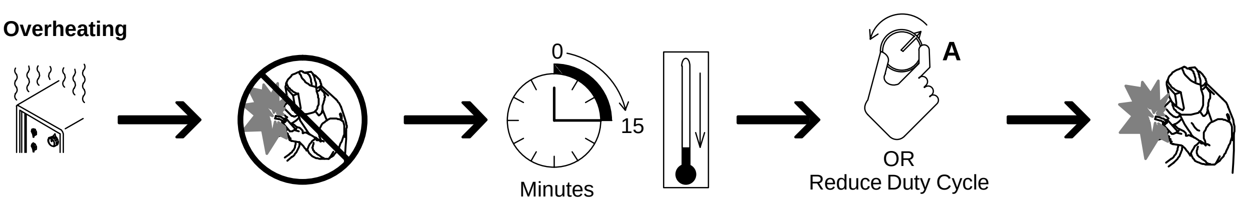
40% Duty Cycle At 250 Amperes



60% Duty Cycle At 200 Amperes



Overheating

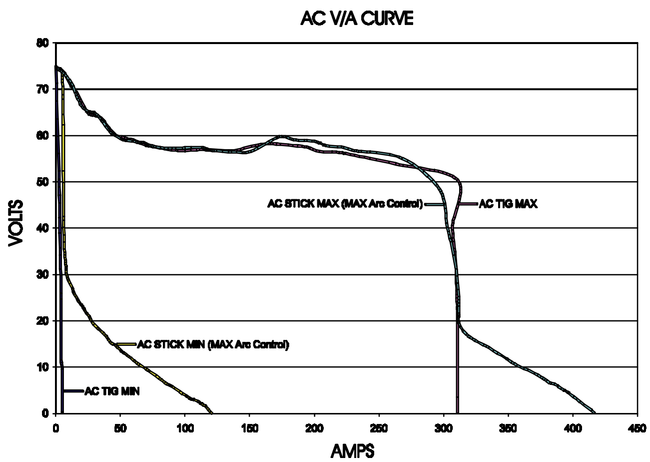


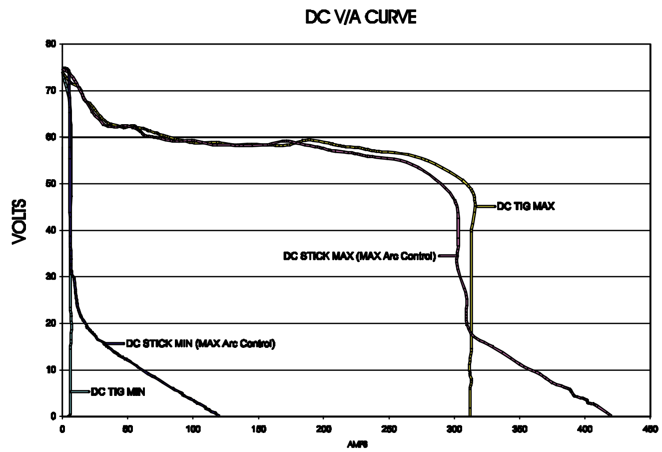
duty1 4/95 / SB-116 198

4-5. Volt-Ampere Curves

The volt-ampere curves show the minimum and maximum voltage and amperage output capabilities of the welding power source. Curves of other settings fall between the curves shown.

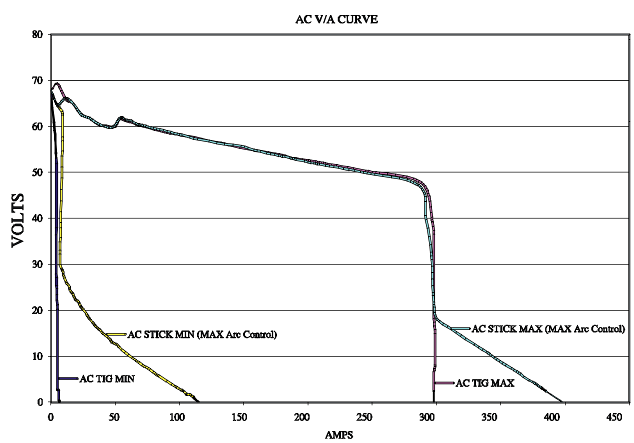
Non Ce Models

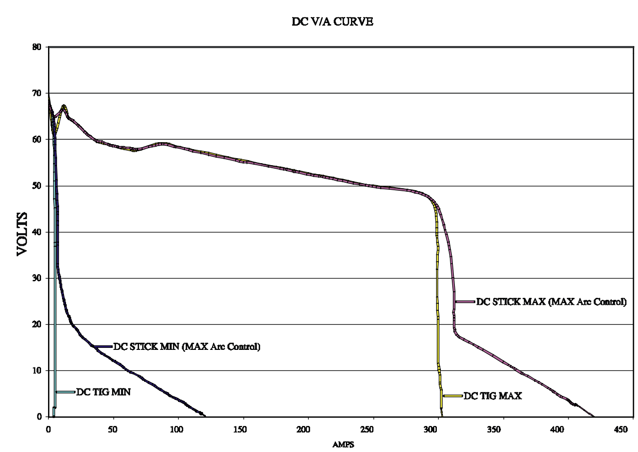




194 385-A / 194 384-A

Ce Models





205 631 / 205 632

4-6. Weld Output Terminals And Selecting Cable Sizes

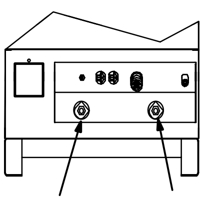
▲ **ARC WELDING can cause Electromagnetic Interference.**

To reduce possible interference, keep weld cables as short as possible, close together, and down low, such as on the floor. Locate welding operation 100 meters from any sensitive electronic equipment. Be sure this welding machine is installed and grounded according to this manual. If interference still occurs, the user must take extra measures such as moving the welding machine, using shielded cables, using line filters, or shielding the work area.

Weld Output Terminals

▲ **Turn off power before connecting to weld output terminals.**

▲ **Do not use worn, damaged, undersized, or poorly spliced cables.**



Ref. ST-801 972-C

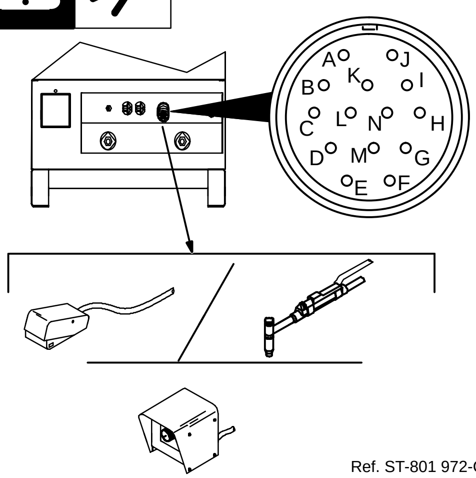
Welding Amperes	Total Cable (Copper) Length In Weld Circuit Not Exceeding							
	100 ft (30 m) Or Less		150 ft (45 m)	200 ft (60 m)	250 ft (70 m)	300 ft (90 m)	350 ft (105 m)	400 ft (120 m)
	10 – 60% Duty Cycle	60 – 100% Duty Cycle	10 – 100% Duty Cycle					
100	4	4	4	3	2	1	1/0	1/0
150	3	3	2	1	1/0	2/0	3/0	3/0
200	3	2	1	1/0	2/0	3/0	4/0	4/0
250	2	1	1/0	2/0	3/0	4/0	2-2/0	2-2/0
300	1	1/0	2/0	3/0	4/0	2-2/0	2-3/0	2-3/0
350	1/0	2/0	3/0	4/0	2-2/0	2-3/0	2-3/0	2-4/0
400	1/0	2/0	3/0	4/0	2-2/0	2-3/0	2-4/0	2-4/0
500	2/0	3/0	4/0	2-2/0	2-3/0	2-4/0	3-3/0	3-3/0

Weld cable size (AWG) is based on either a 4 volts or less drop or a current density of at least 300 circular mils per ampere
*Select weld cable size for pulsing application at peak amperage value..

S-0007-D

4-7. Remote 14 Receptacle Information

▲ **Turn off power before connecting to receptacle.**



Ref. ST-801 972-C

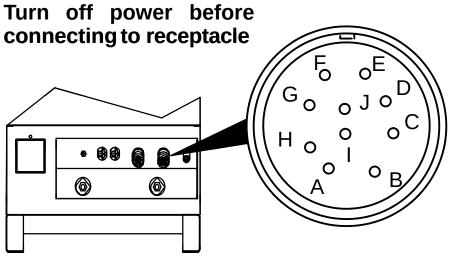
REMOTE 14	Socket*	Socket Information
24 VOLTS DC OUTPUT CONTACTOR	A	Contactor control 24 volts dc.
	B	Contact closure to A completes 24 volts dc contactor control circuit and enables output.
A REMOTE OUTPUT CONTROL	C	Output to remote control; 0 to +10 volts dc output to remote control.
	D	Remote control/feedback circuit common.
	E	0 to +10 volts dc input command signal from remote control.
A/V AMPERAGE VOLTAGE	F	Current feedback; +1 volt dc per 100 amperes.
	H	Voltage feedback; +1 volt dc per 10 volts output.
GND	K	Chassis common.

*The remaining sockets are not used.

4-8. Automation 10-Pin Connection (Optional)



▲ Turn off power before connecting to receptacle



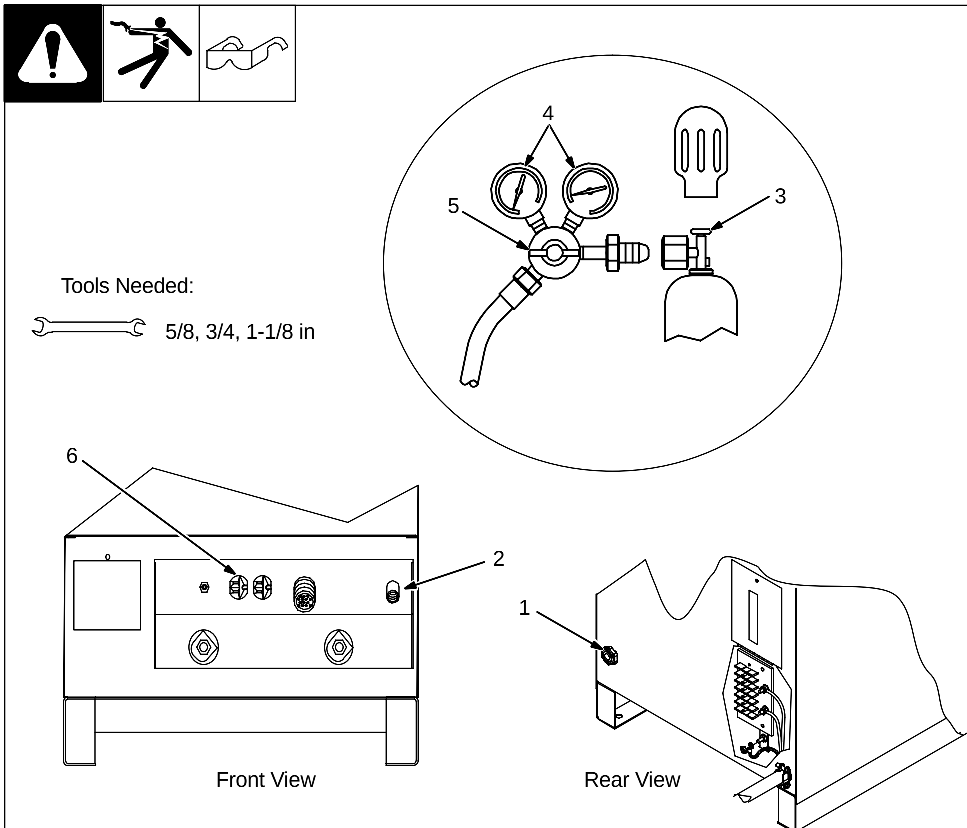
▲ Turn off power before connecting to receptacle

Ref. ST-801 972-C

Socket	Socket Information For 10-Pin Receptacle RC3
A	Start/Stop
B	Gas
C	Output disabled
D	Chassis ground
E	Final slope − collector
F	Final slope − emitter
G	Pulse lockout − collector
H	Pulse lockout − emitter
I	Valid arc − collector
J	Valid arc − emitter

Definitions Of Inputs And Outputs
Inputs
A - Closure to D starts the weld cycle. Opening closure stops weld cycle. Durning 2T operation, a momentary closure (greater than 100ms, but less than 3/4 seconds) starts and stops weld output.
B - Closure to D turns on gas. This input will override Postflow, but if a Preflow time is entered, the Preflow cycle will time out before arc initiation.
C - Closure to D must be maintained at all times. If the closure between pins C and D is broken, an output disable occurs, Postflow begins to time out, and HELP 13 will be displayed on the meters.
Outputs
Outputs are isolated open-collector transistor which are able to conduct at least 6 mA of current, with a maximum of 100 mA of current and 30 VDC.
Final Slope - output is on when in Final Slope.
Pulse Lockout - output is on when in Initial Amperage, Initial Slope, Final Slope, Final Amperage, and when the pulse frequency is less than 10 Hz.
Arc On - output is on when the contactor is on and there is less than 50 load volts.

4-9. Shielding Gas Connections And 115 Volts AC Duplex Receptacle



Tools Needed:

5/8, 3/4, 1-1/8 in

▲ **Turn Off power before connecting to receptacle.**

1 Gas Valve In Fitting

Located on rear of unit.

2 Gas Valve Out Fitting

Fittings have 5/8-18 right-hand threads.

3 Cylinder Valve

Open valve slightly so gas flow blows dirt from valve. Close valve.

4 Regulator/Flow Gauge

Connect regulator/flow gauge to gas cylinder.

Connect customer supplied gas hose between regulator/flow gauge and gas in fitting.

5 Flow Adjust

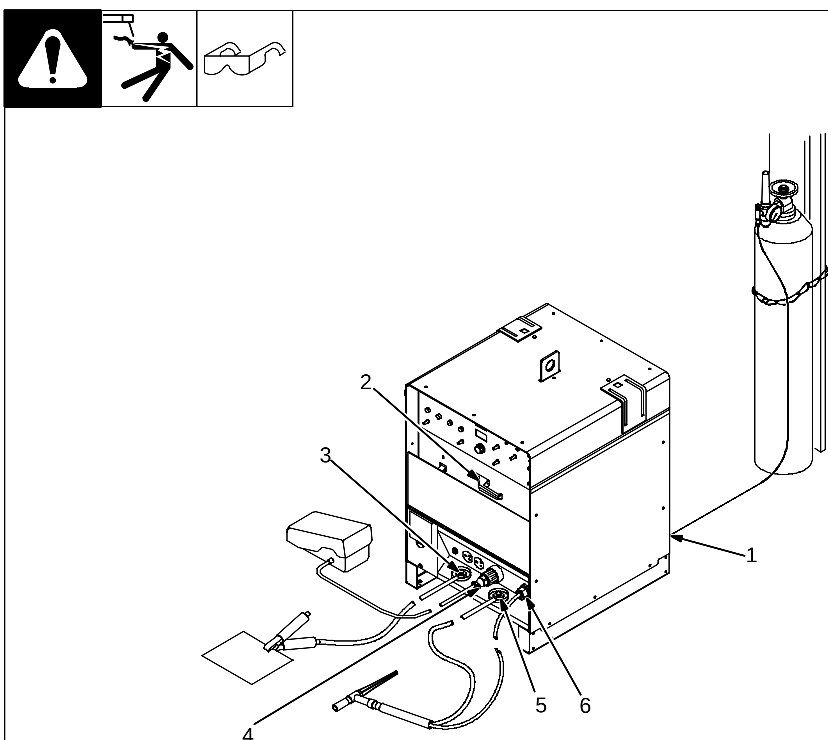
Typical flow rate is 20 cfh (cubic feet per hour).

6 115 V 15 Amp AC Receptacle

Receptacle is protected from overload by circuit breaker CB1 (see Section 6-2).

Ref. ST-801 972-C / Ref. ST-801 973 / Ref. ST-157 858

4-10. TIG Connections



Tools Needed:

11/16, (21 mm), 3/4 in

▲ **Turn Off power before making connections.**

1 Gas In Connection

Connect gas hose from gas supply to gas in fitting.

2 Output Selector Switch (See Section 5-2)

Switch is shown in DCEN (direct current electrode negative) position for TIG HF Impulse DCEN welding. For front panel control dispay, see Section 4-11. For TIG AC welding, place switch in AC position (see Section 5-2). For TIG AC front panel control dispay, see Section 4-12.

3 Work Weld Output Terminal

Connect work lead to work weld output terminal.

4 Remote 14 Receptacle

Connect desired remote control to Remote 14 receptacle.

5 Electrode Weld Output Terminal

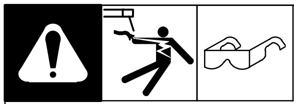
Connect TIG torch to electrode weld outout terminal.

6 Gas Out Connection

Connect torch gas hose to gas out fitting.

802 734-C

4-11. Front Panel Display For TIG HF Impulse DCEN (Direct Current Electrode Negative)

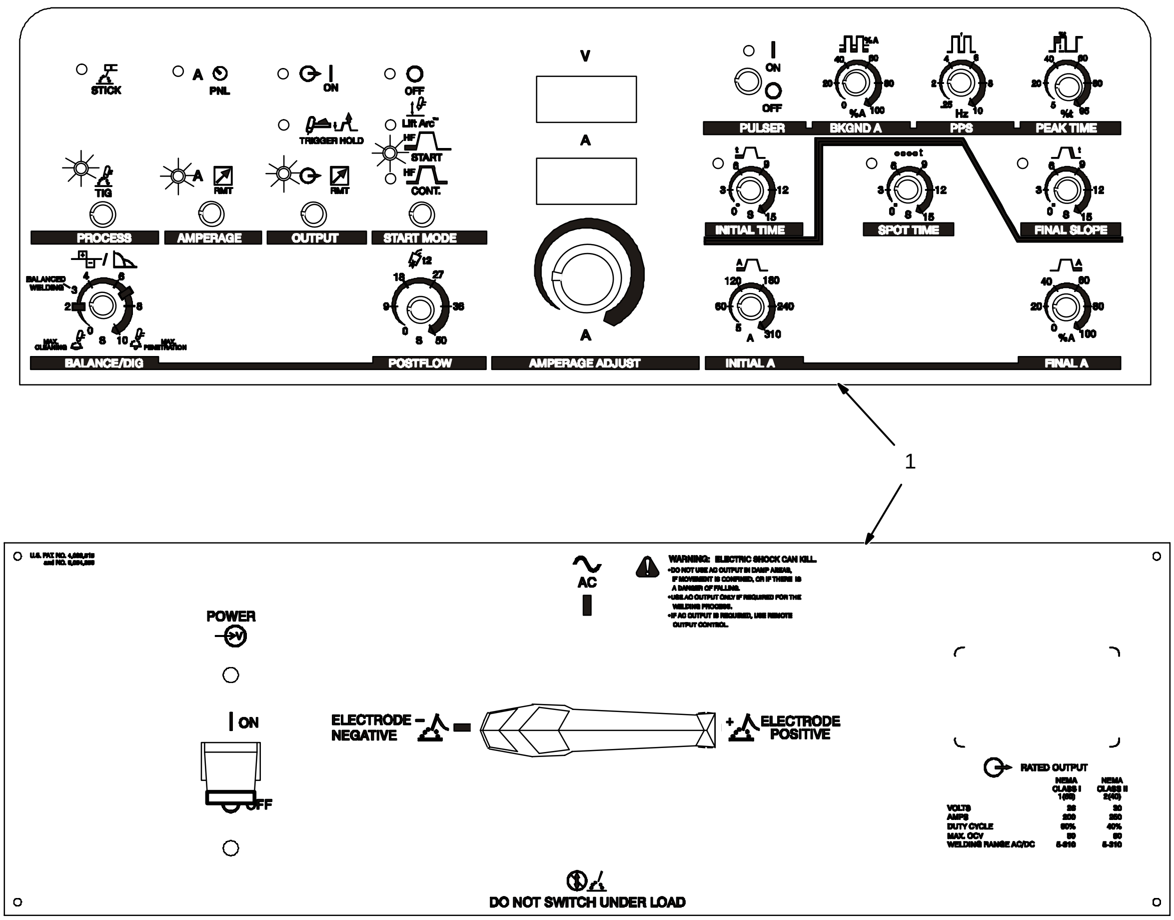


1 Front Panel

Correct front panel display for basic TIG HF Impulse DCEN welding.

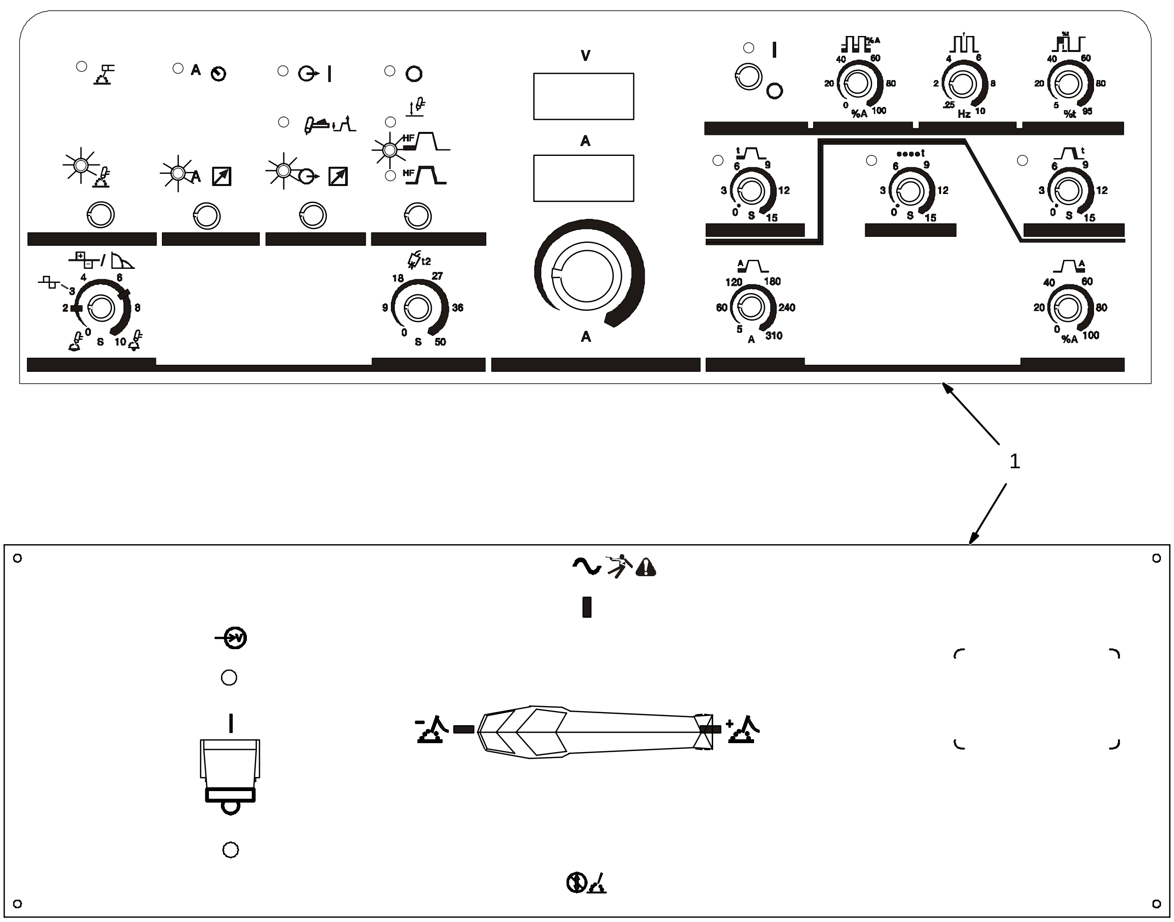
☞ *For all front panel switch pad controls: press switch pad to turn on light and enable function.*

NOTE: Green on nameplate indicates a TIG function (see Section 5-1 for description of controls).



Return To Table Of Contents

CE Models



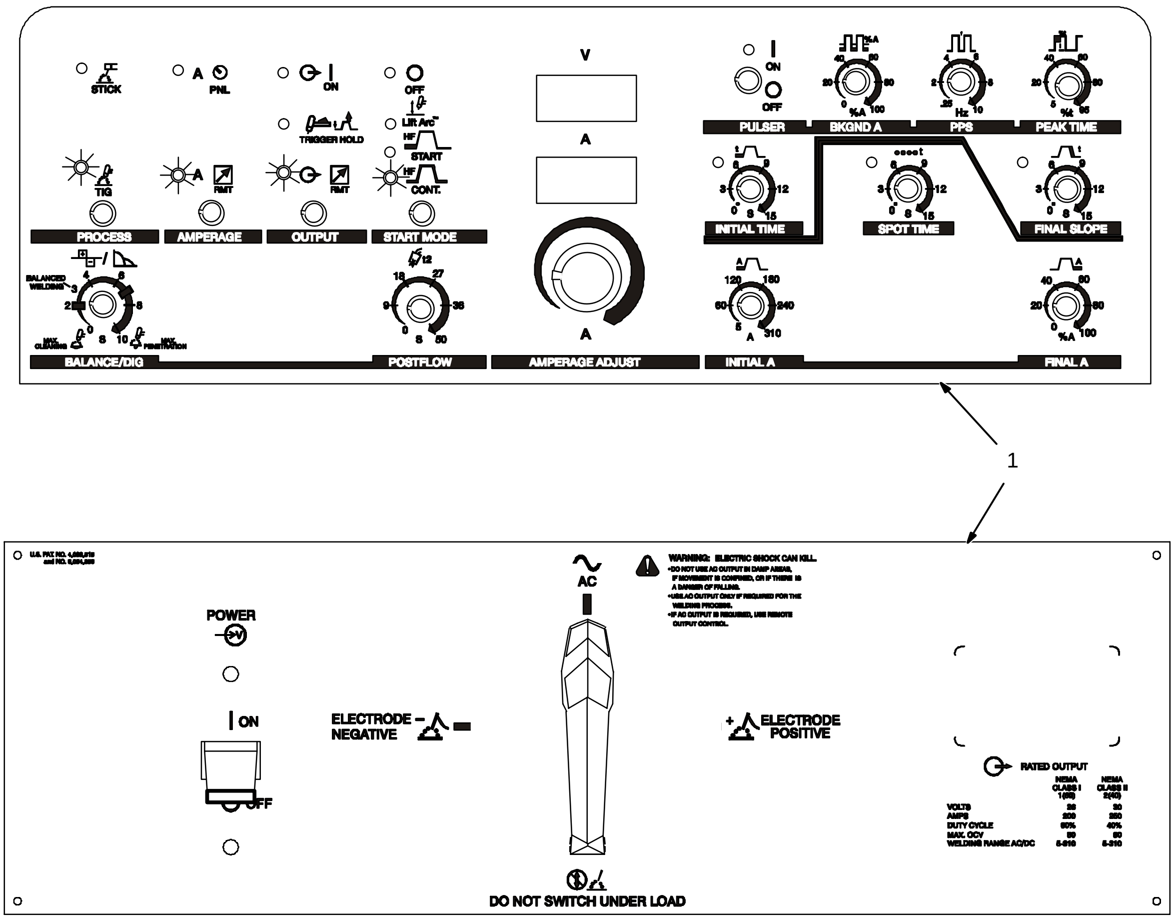
4-12. Front Panel Display For TIG AC

1 Front Panel

Correct front panel display for basic TIG AC welding.

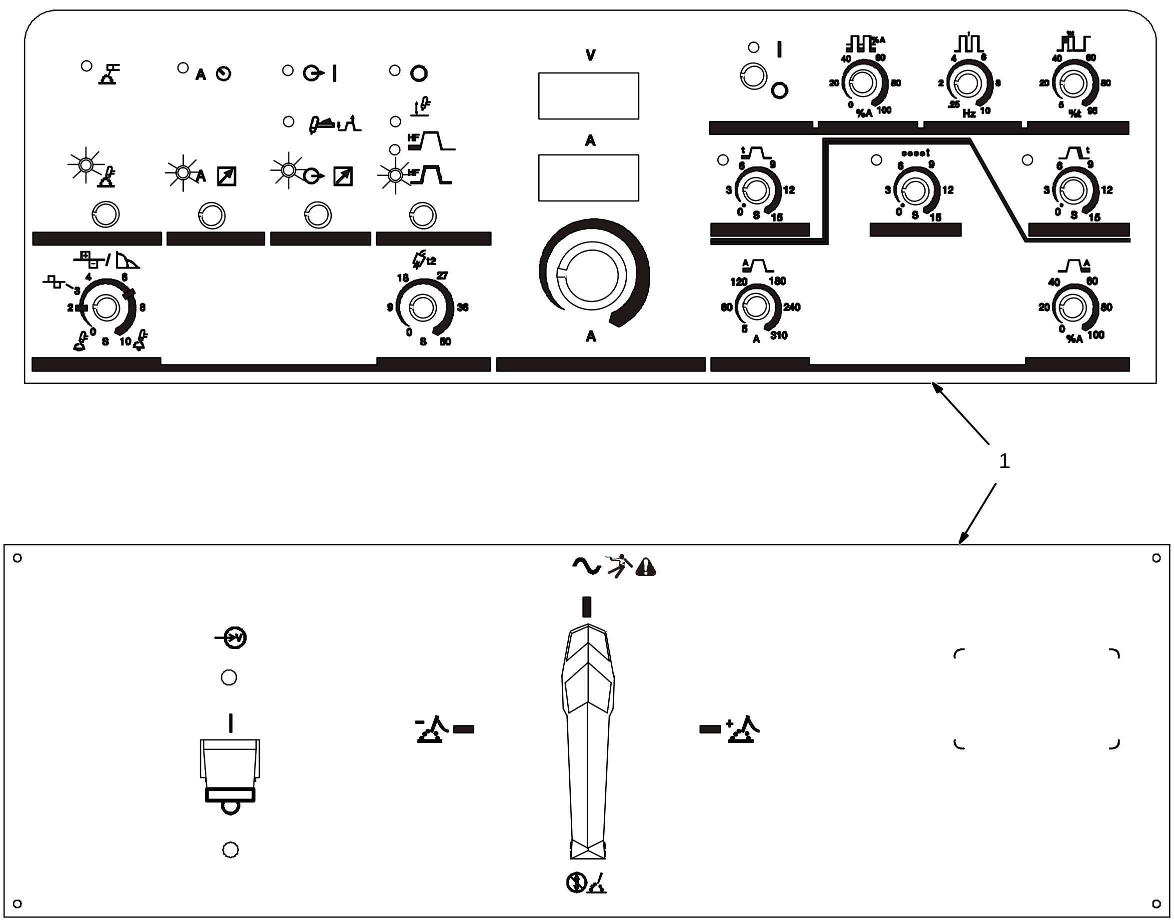
For all front panel switch pad controls: press switch pad to turn on light and enable function.

NOTE: Green on nameplate indicates a TIG function (see Section 5-1 for description of controls).



Return To Table Of Contents

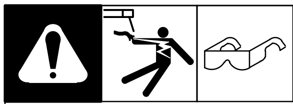
CE Models

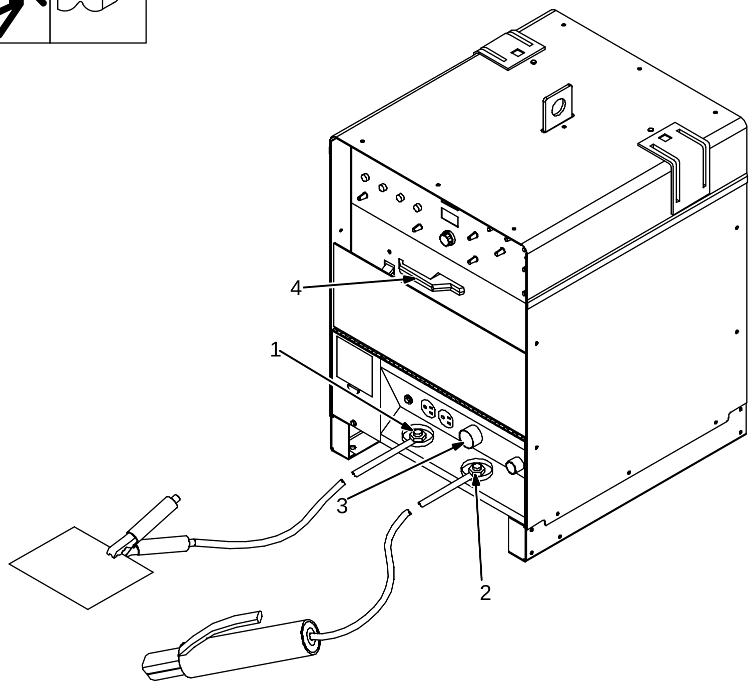


Notes

Return To Table Of Contents

4-13. Stick Connections





▲ **Turn Off power before making connections.**

1 Work Weld Output Terminal

Connect work lead to work weld output terminal.

2 Electrode Weld Output Terminal

Connect electrode holder to electrode weld outout terminal.

3 Remote 14 Receptacle

If desired, connect remote control to Remote 14 receptacle.

4 Output Selector Switch (See Section 5-2)

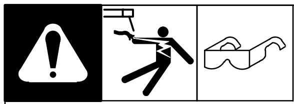
Switch is shown in DCEP (direct current electrode positive) position for Stick DCEP welding. For front panel control dispay, see Section 4-14. For Stick AC welding, place switch in AC position (see Section 5-2). For Stick AC front panel control dispay, see Section 4-15.

Tools Needed:

11/16, (21 mm), 3/4 in

802 733-C

4-14. Front Panel Display For Stick DCEP (Direct Current Electrode Positive)

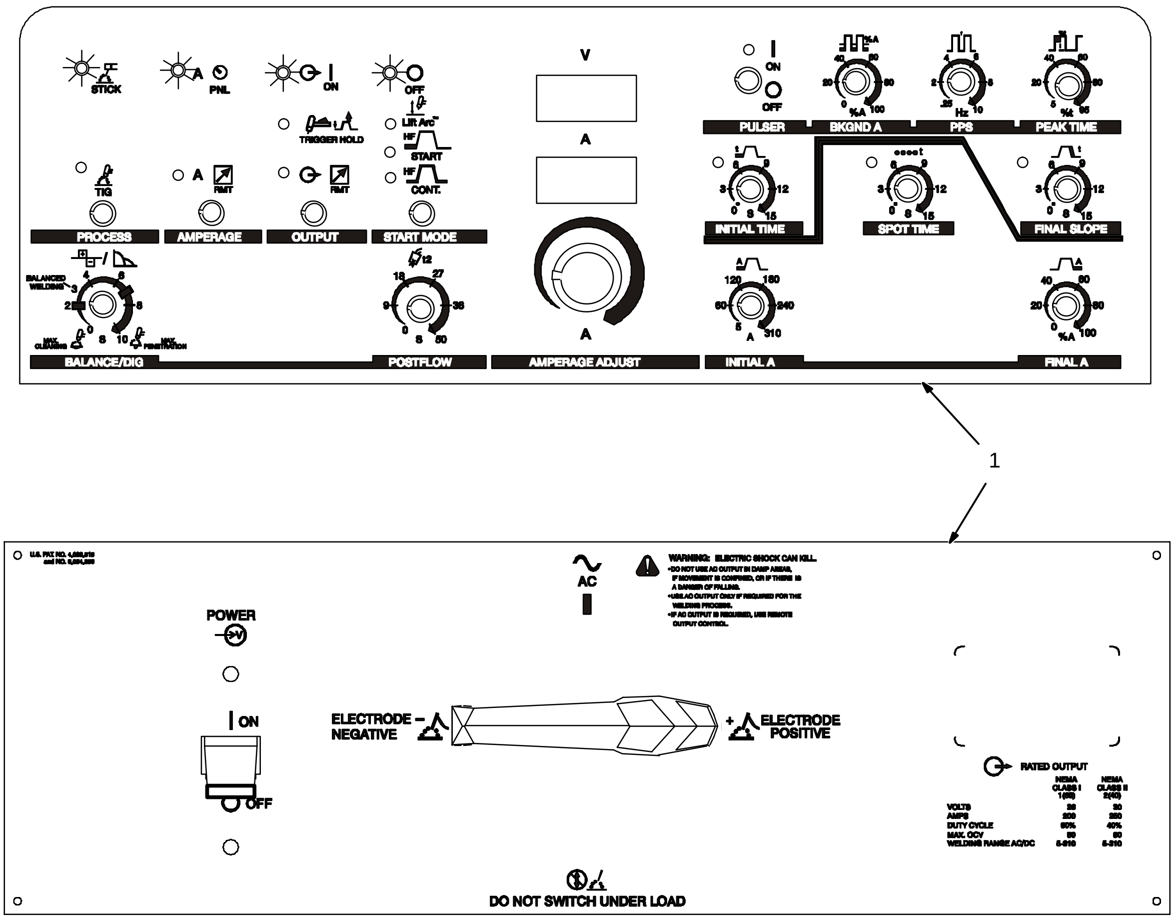


1 Front Panel

Correct front panel display for basic Stick DCEP welding.

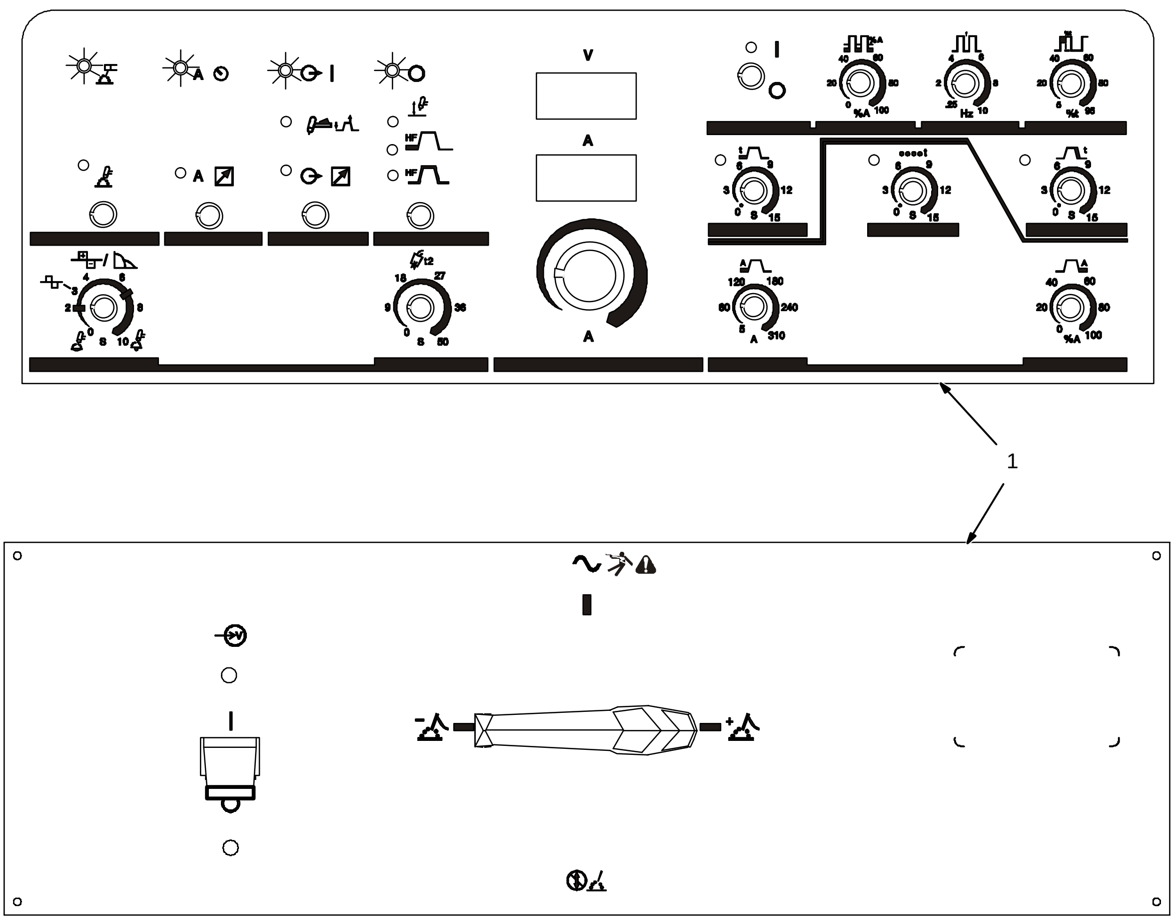
☞ *For all front panel switch pad controls: press switch pad to turn on light and enable function.*

NOTE: Gray on nameplate indicates a Stick function (see Section 5-1 for description of controls).



Return To Table Of Contents

CE Models



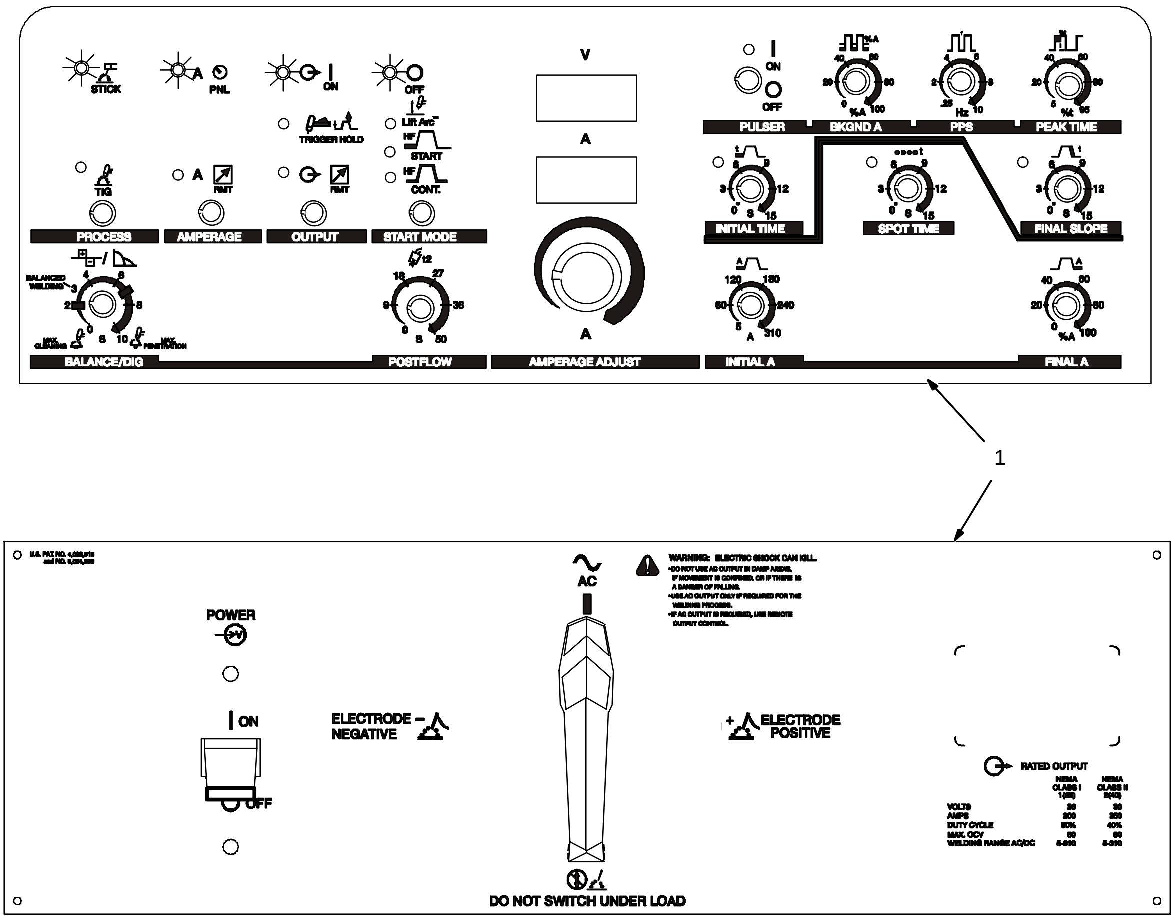
4-15. Front Panel Display For Stick AC

1 Front Panel

Correct front panel display for basic Stick AC welding.

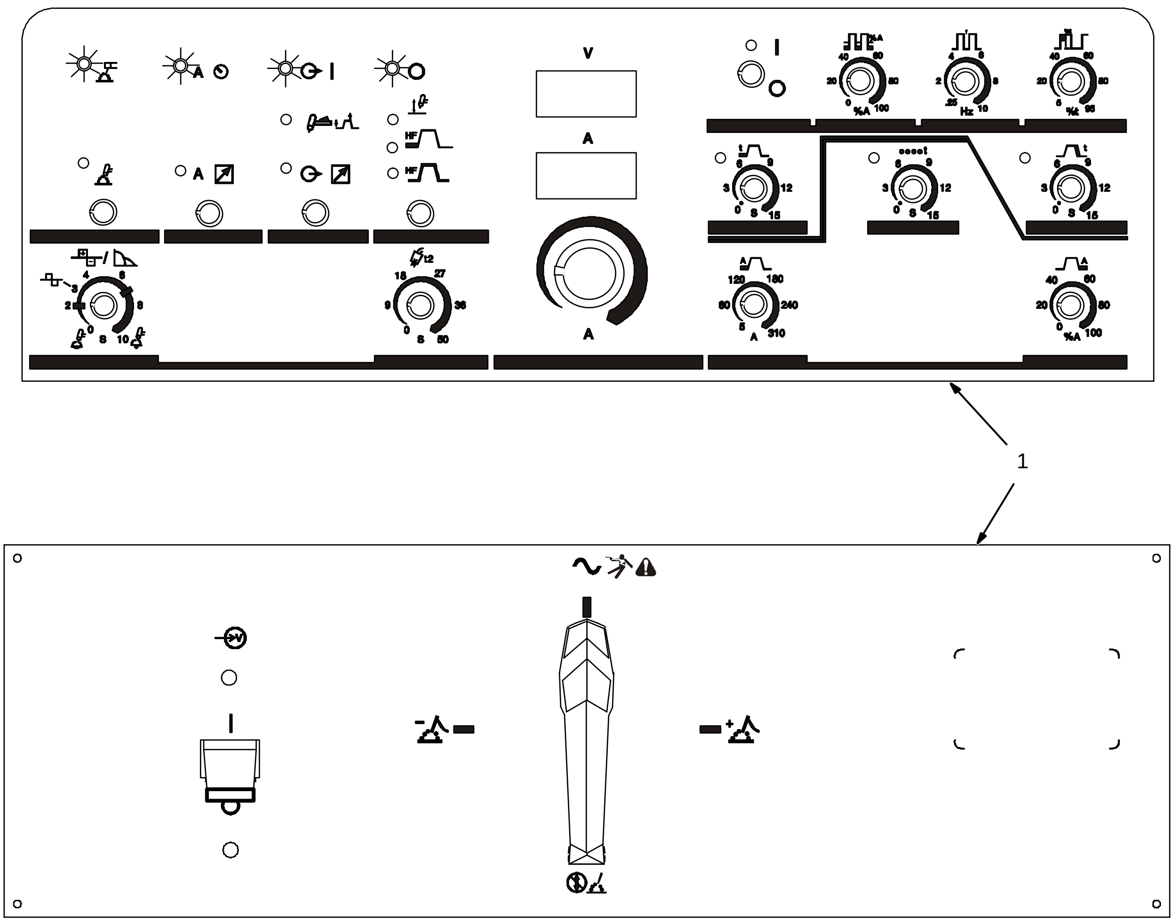
☞ *For all front panel switch pad controls: press switch pad to turn on light and enable function.*

NOTE: Gray on nameplate indicates a Stick function (see Section 5-1 for description of controls).



Return To Table Of Contents

CE Models



4-16. Electrical Service Guide

NOTE	*All values in both tables were calculated at 60% duty cycle.*

50/60 Hertz Models	Without Power Factor Correction							
Input Voltage	200	220	230	400	440	460	520	575
Input Amperes At Rated Output	88	82	77	45	41	38	35	31
Max Recommended Standard Fuse Or Circuit Breaker Rating In Amperes Circuit Breaker [1]								
Time-Delay Fuse [2]	125	125	125	70	60	60	50	45
Normal Operating (Fast) Fuse [3]	125	125	125	70	60	60	50	45
Min Input Conductor Size In AWG/Kcmil	4	6	6	8	8	10	10	10
Max Recommended Input Conductor Length In Feet (Meters)	167 (51)	137 (42)	153 (47)	305 (93)	369 (112)	281 (86)	352 (107)	439 (134)
Min Grounding Conductor Size In AWG/Kcmil	6	6	6	8	10	10	10	10

Reference: 1999 National Electrical Code (NEC)

1 Choose a circuit breaker with time-current curves comparable to a time-delay fuse.

2 “Time-Delay” fuses are UL class “RK5” .

3 “Normal Operating” (fast) fuses are UL class “K5” (up to and including 60 amp), and UL class “H” (65 amp and above).

▲ **Failure to follow these fuse and circuit breaker recommendations could create an electric shock or fire hazard.**

50/60 Hertz Models	With Power Factor Correction							
Input Voltage	200	220	230	400	440	460	520	575
Input Amperes At Rated Output	60	61	52	34	31	26	26	21
Max Recommended Standard Fuse Or Circuit Breaker Rating In Amperes Circuit Breaker [1]								
Time-Delay Fuse [2]	90	90	80	50	45	40	40	30
Normal Operating (Fast) Fuse [3]	90	90	80	50	45	40	40	30
Min Input Conductor Size In AWG/Kcmil	8	8	8	10	10	10	10	12
Max Recommended Input Conductor Length In Feet (Meters)	87 (26)	102 (31)	115 (35)	226 (69)	274 (84)	308 (94)	383 (117)	295 (90)
Min Grounding Conductor Size In AWG/Kcmil	8	8	8	10	10	10	10	12

Reference: 1999 National Electrical Code (NEC)

1 Choose a circuit breaker with time-current curves comparable to a time-delay fuse.

2 “Time-Delay” fuses are UL class “RK5” .

3 “Normal Operating” (fast) fuses are UL class “K5” (up to and including 60 amp), and UL class “H” (65 amp and above).

▲ **Failure to follow these fuse and circuit breaker recommendations could create an electric shock or fire hazard.**

Return To Table Of Contents

4-17. Placing Jumper Links



▲ **Disconnect and lockout/tagout input power before installing or moving jumper links.**

Check input voltage available at site.

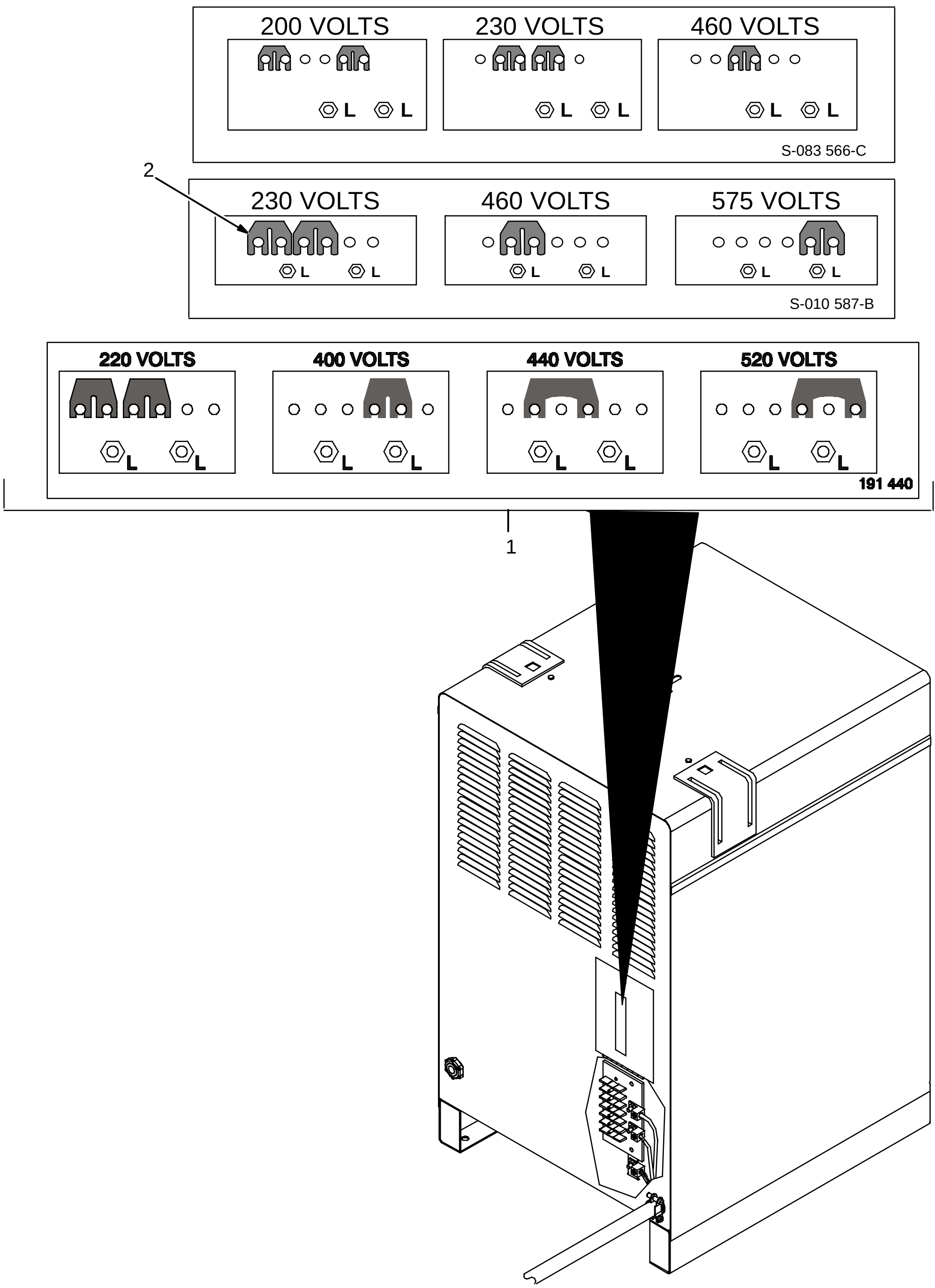
1 Jumper Link Label

Check label − only one is on unit.

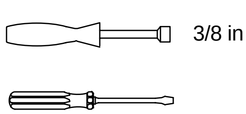
2 Jumper Links

Move jumper links to match input voltage.

Close and secure access door, or go on to Section 4-18.

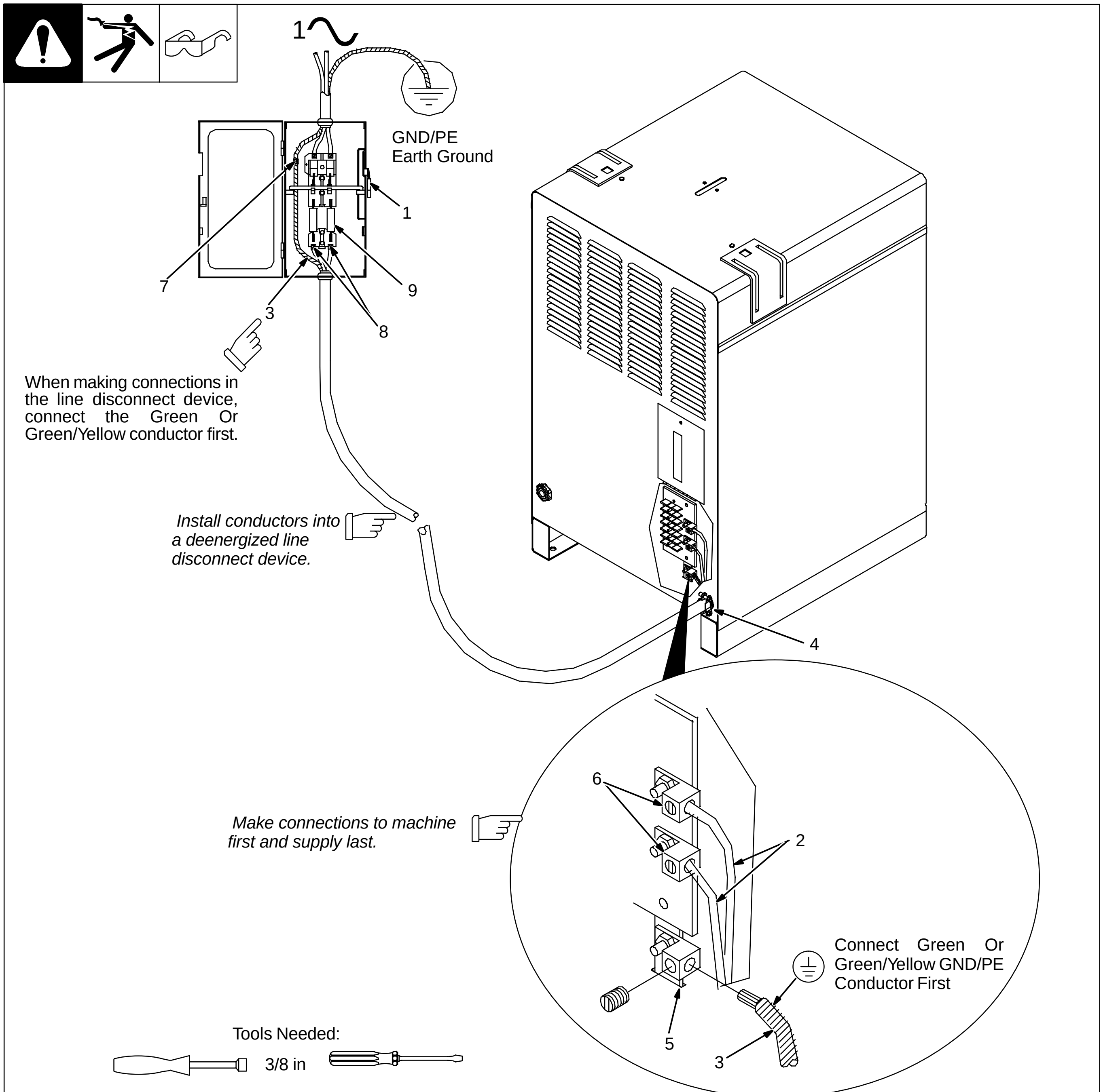


Tools Needed:



Ref. ST-801 973-B

4-18. Connecting Input Power



Ref. ST-801 973-B

▲ **Disconnect and lockout/tagout input power before connecting input conductors from unit.**

▲ **Have only qualified persons make this installation.**

See rating label on unit and check input voltage available at site.

1 Line Disconnect Device

2 Input Conductors

3 Grounding Conductor

Select size and length using Section 4-16. Conductors must comply with national, state, and local electrical codes. If applicable, use lugs of proper amperage capacity and correct hole size.

4 Strain Relief

Route conductors through strain relief.

5 Machine Grounding Terminal

6 Line Terminals

▲ **Make input power connections to the welding power source before making connections into a deenergized line disconnect device.**

Connect green or green/yellow grounding conductor to machine grounding terminal first. Then connect input conductors to line terminals.

Close access door.

7 Disconnect Device (Supply) Grounding Terminal

8 Disconnect Device Line Terminals

▲ **In the deenergized line disconnect device, connect green or green/yellow grounding conductor to supply grounding terminal first, never to a line terminal. Be sure grounding conductor goes to an earth ground.**

Connect input conductors to line terminals.

9 Overcurrent Protection

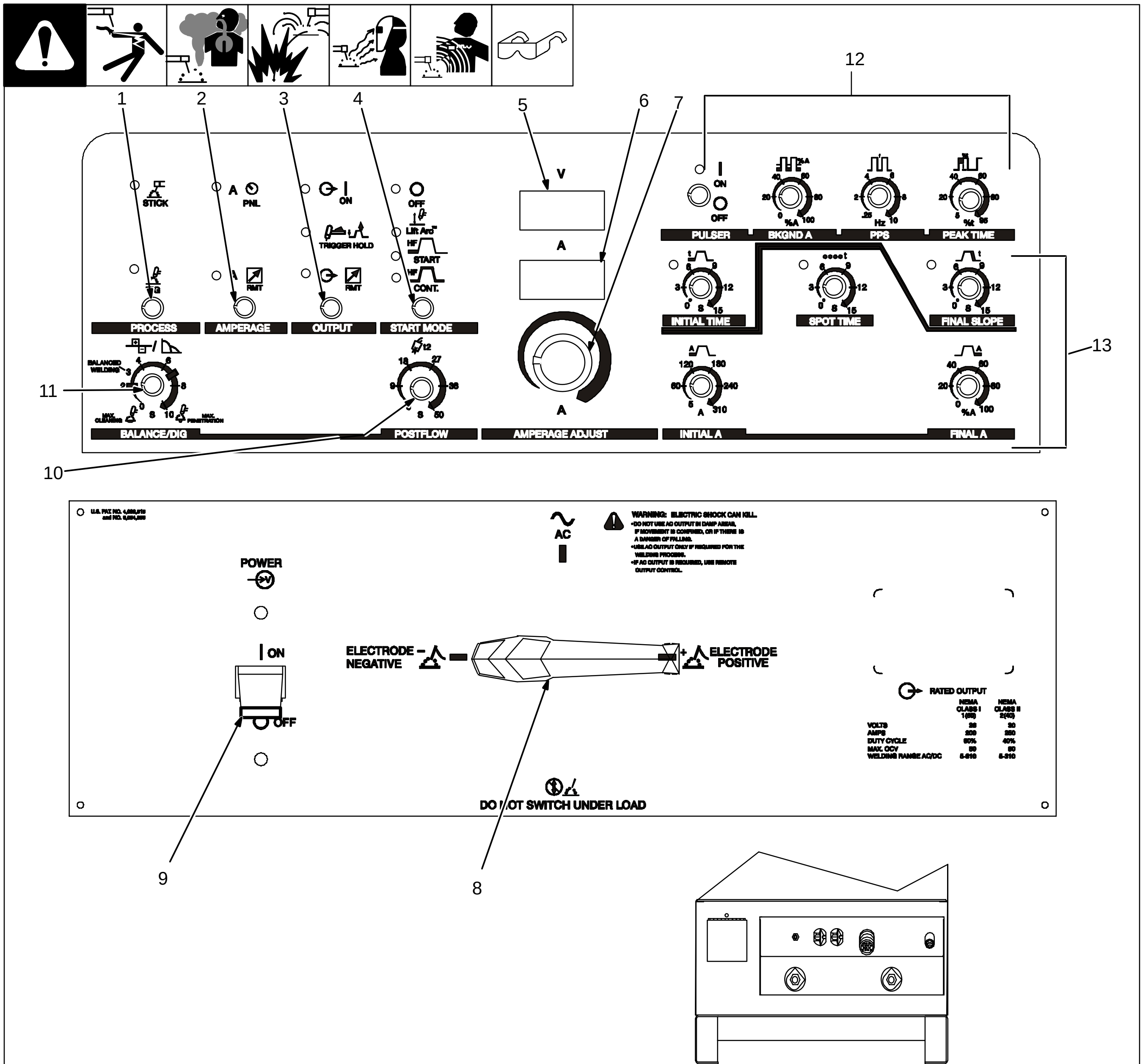
Select type and size using Section 4-16 (fused disconnect switch shown).

Close door on line disconnect device.

SECTION 5 − OPERATION

5-1. Controls

A. For 200/230/460 Volts And Non CE Units



☞ *Top row of lights in upper left corner are On for SMAW. Bottom row are On for GTAW.*

Green on nameplate indicates a TIG function, Gray indicates a Stick function.

1 Process Control

See Section 5-3.

2 Amperage Control

See Section 5-4.

3 Output Control

See Section 5-5.

4 Start Mode Control

See Section 5-9.

5 Voltmeter

See Section 5-10

6 Ammeter

See Section 5-10

7 Amperage Adjustment Control

See Section 5-11.

8 Output Selector Switch

See Section 5-2.

9 Power Switch

Use switch to turn unit Off and On.

10 Postflow Time Control

See Section 5-14.

11 Balance/DIG Control

See Section 5-12.

12 Pulser Controls (Optional)

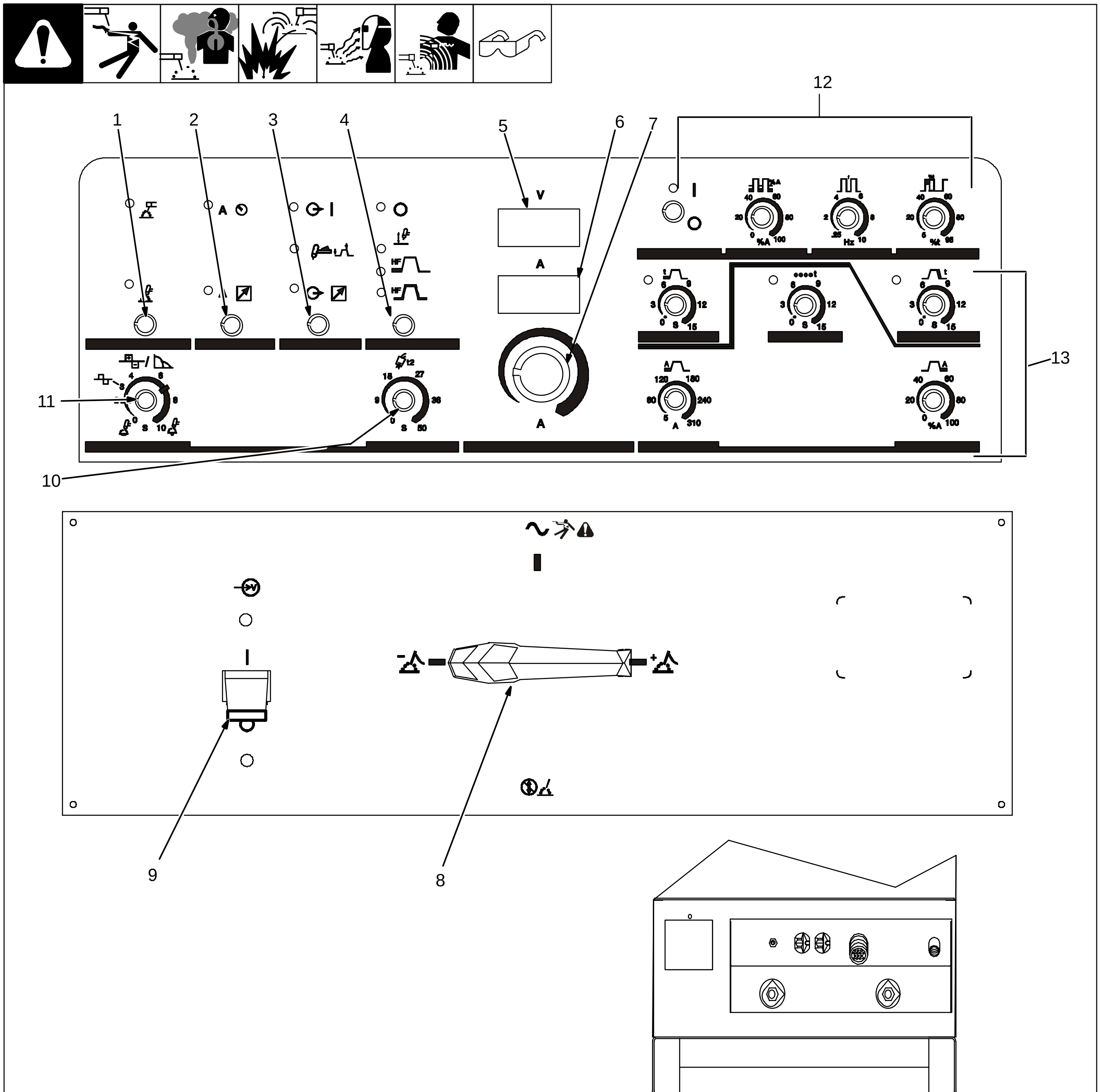
See Section 5-15.

13 Sequence Controls (Optional)

See Section 5-16.

204 776 / Ref. ST-801 972

B. For CE Units



☞ *Top row of lights in upper left corner are On for SMAW. Bottom row are On for GTAW.*

Green on nameplate indicates a TIG function, Gray indicates a Stick function.

1 Process Control

See Section 5-3.

2 Amperage Control

See Section 5-4.

3 Output Control

See Section 5-5.

4 Start Mode Control

See Section 5-9.

5 Voltmeter

See Section 5-10

6 Ammeter

See Section 5-10

7 Amperage Adjustment Control

See Section 5-11.

8 Output Selector Switch

See Section 5-2.

9 Power Switch

Use switch to turn unit Off and On.

10 Postflow Time Control

See Section 5-14.

11 Balance/DIG Control

See Section 5-12.

12 Pulser Controls (Optional)

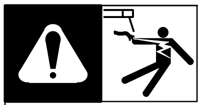
See Section 5-15.

13 Sequence Controls (Optional)

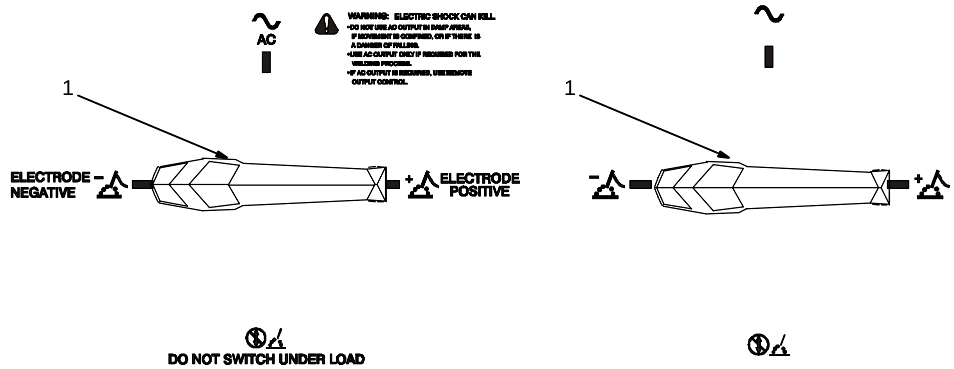
See Section 5-16.

208 242 / Ref. ST-801 972-C

5-2. Output Selector Switch



(CE Nameplate)



1 Output Selector Switch

▲ **Do not use AC output in damp areas, if movement is confined, or if there is danger of falling. Use AC output ONLY if required for the welding process, and then use a remote control.**

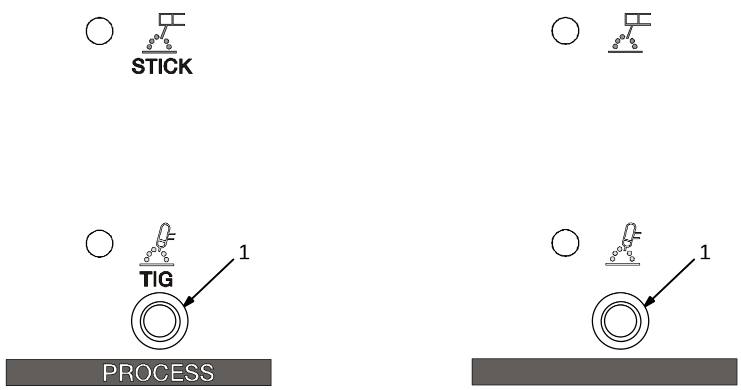
▲ **Do not change position of switch while welding or while under load.**

Use switch to select (DCEN) Direct Current Electrode Negative, AC, or (DCEP) Direct Current Electrode Positive output.

NOTE: Changing position of Output Selector switch may also change Process control, Current control, Output control, and Start Mode control settings to properly function with latest Output Selector switch setting.

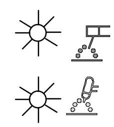
5-3. Process Control

(CE Nameplate)



1 Process Control

Use control to select Shielded Metal Arc Welding (SMAW) or Gas Tungsten Arc Welding (GTAW) process.



For SMAW, press button to toggle LED to Stick position.

For GTAW, press button to toggle LED to TIG position.

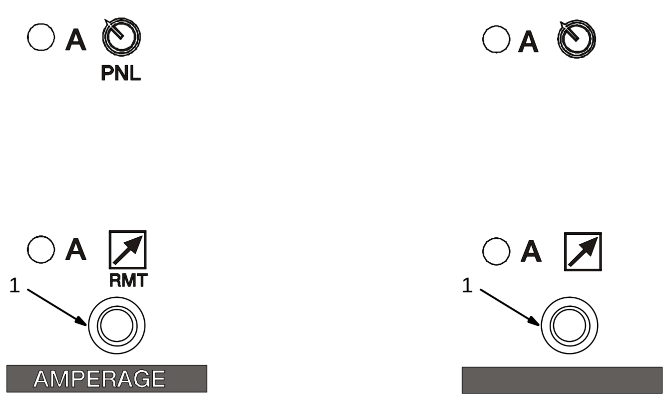
NOTE: Lit LED indicates selected mode.

When Output Selector switch position changes, LED may change position, based upon last selection.

Ref. ST-196 616 / Ref. ST-196 764

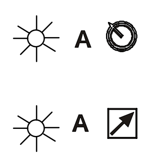
5-4. Amperage Control

(CE Nameplate)



1 Amperage Control

Use control to select front panel or remote amperage control.



For front panel amperage control, press button to toggle LED to Panel position.

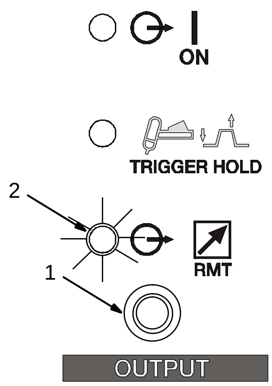
For remote amperage control, press button to toggle LED to Remote position (see Section 4-7).

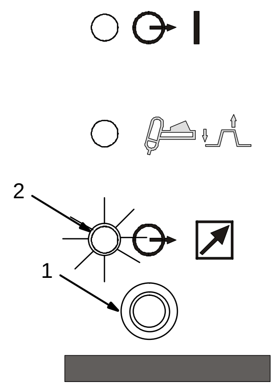
NOTE: Lit LED indicates selected mode.

When Output Selector switch position changes, LED may change position, based upon last selection.

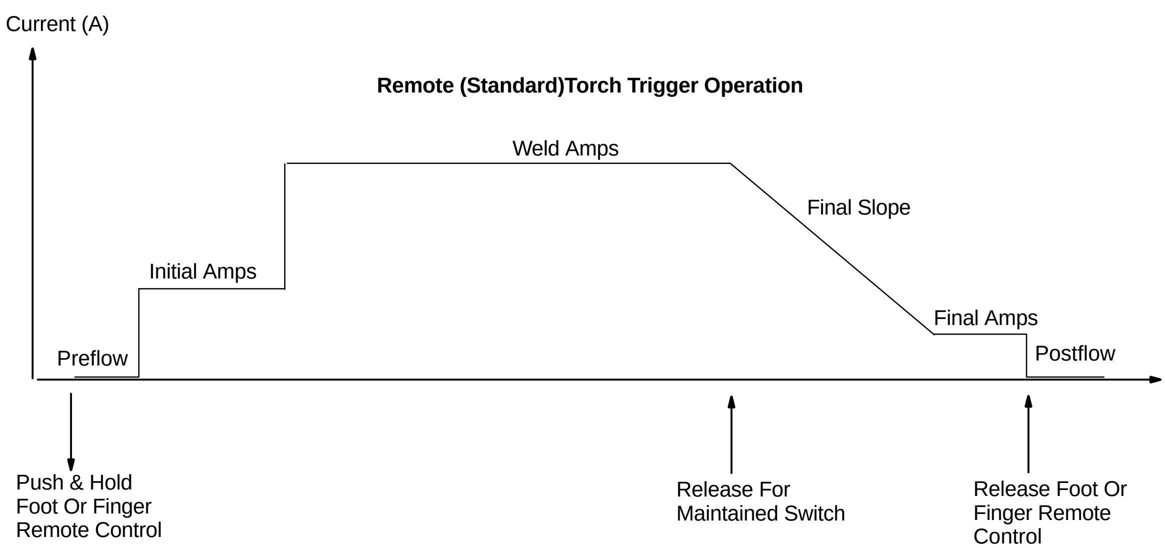
5-5. Output Control

Remote (Standard)Torch Trigger Operation





(CE Nameplate)



1 Output Control

▲ **Weld output terminals are energized when power is On, and Output On LED is lit.**

Use control to select front panel, trigger hold, or remote output control.

NOTE: Lit LED indicates selected mode.

For weld output, press button to toggle LED to On position.

2 Remote Trigger (Standard) Operation

For remote output control, press button to toggle LED to Remote position (see Section 4-7).

Torch trigger operation is as shown.

NOTE: Initial weld amperage and final amperage is controlled by the remote device, not by the welding power source.

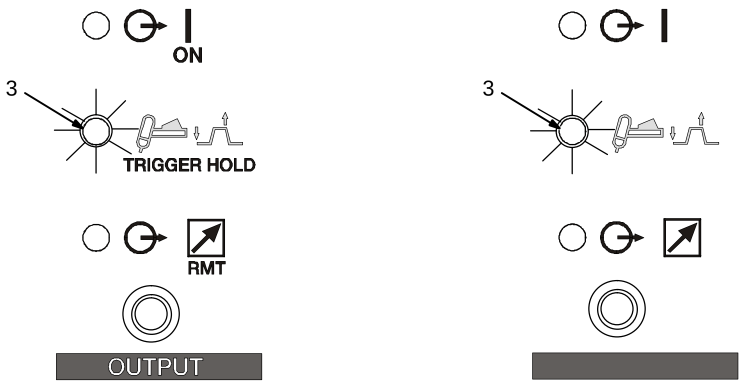
NOTE: If On/Off only type trigger is used, it must be a maintained switch. All functions become active.

Application: Use Remote Trigger when the operator desires to use a foot pedal or finger amperage control.

When Output Selector switch (see Section 5-2) position changes, Output control LED will always switch to Remote.

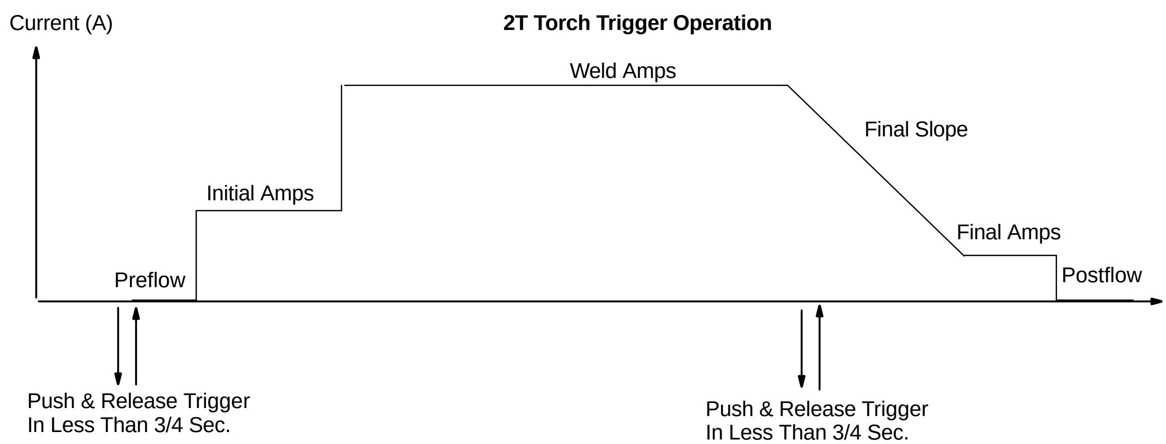
When Output On is selected, HF and gas control are disabled.

Trigger Hold (2T)



(CE Nameplate)

2T Torch Trigger Operation



NOTE: If torch trigger is held more than 3 seconds, operation reverts to Remote Trigger (Standard) mode (see previous page).
If arc is broken and trigger is depressed, HLP-10 will be displayed (see Section 6-4).

3 Trigger Hold

For trigger hold operation, press button to toggle LED to Trigger Hold position.

Torch trigger operation is as shown.

NOTE: When a foot or finger remote control is connected to the welding power source, only trigger input is functional.

NOTE: Amperage is controlled by the welding power source.

Application: Use Trigger Hold (2T) when long extended welds are made. Trigger Hold (2T) can help to reduce operator fatigue.

5-6. 4T, 4T Momentary And Mini Logoic Trigger Operation (RequiresOptional Sequence Controls)

4T Torch Trigger Operation

If unit is equipped with optional Sequence Controls (see Section 5-16), 4T trigger method is available.

4T torch trigger operation is as shown.

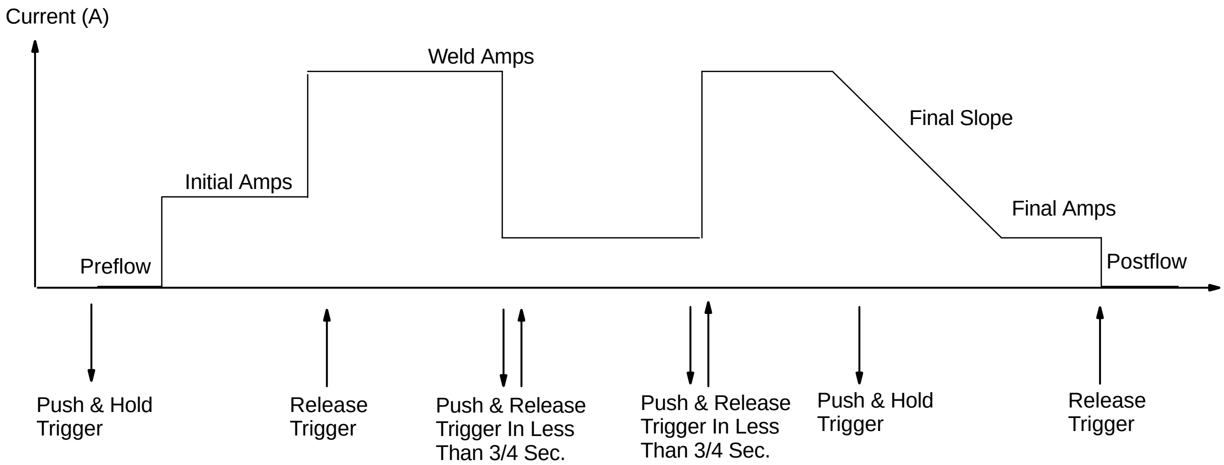
While in 4T mode, there is a feature available during the main weld sequence that allows the operator to toggle between weld current and final current without breaking the arc.

NOTE: When a remote switch is connected to the welding power source, only trigger input is functional. Amperage is controlled by the welding power source.

Application:

Use 4T trigger method when the functions of a remote current control are desired, but only a remote on/off control is available.

Select 4T trigger method according to Section 5-7.



4T Momentary Torch Trigger Operation

If unit is equipped with optional Sequence Controls (see Section 5-16), 4T Momentary trigger method is available.

4T Momentary torch trigger operation is as shown.

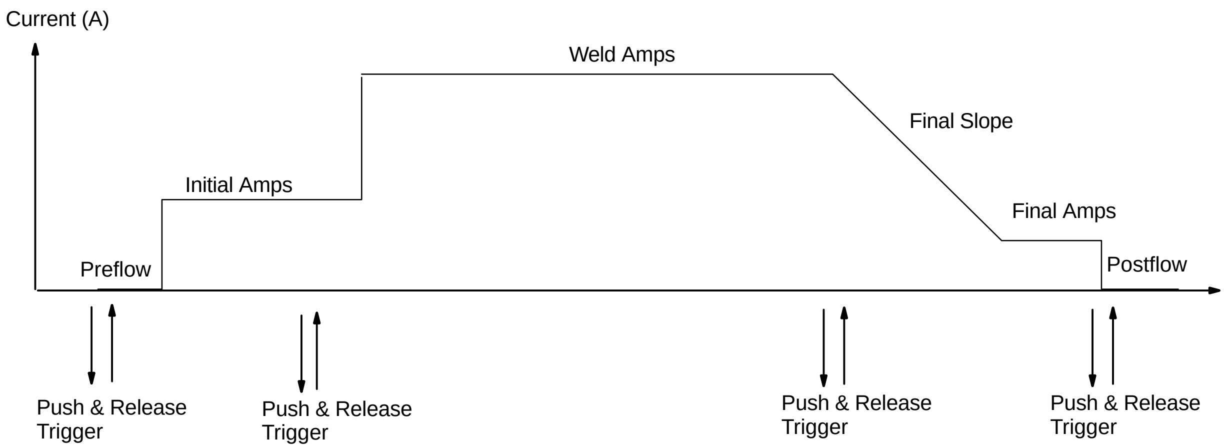
While in 4T Momentary mode, once the operator toggles out of weld current and begins final slope, toggling again will break the arc and go to postflow.

NOTE: When a remote switch is connected to the welding power source, only trigger input is functional. Amperage is controlled by the welding power source.

Application:

Use 4T Momentary trigger method when the functions of a remote current control are desired, but only a remote on/off control is available.

Select 4T Momentary trigger method according to Section 5-7.



Mini Logic Operation

If unit is equipped with optional Sequence Controls (see Section 5-16), Mini Logic operation is available.

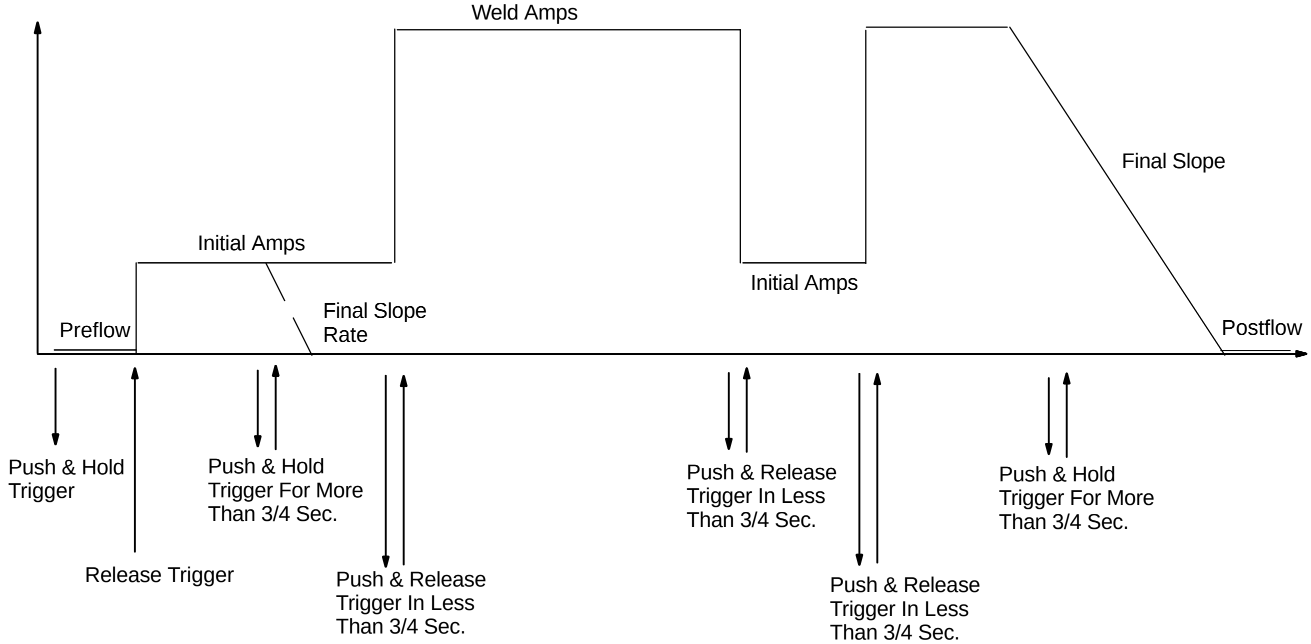
Torch trigger operation is as shown.

During Mini Logic welding operation, the weld amperage can be manually changed from the initial amps level to the main weld amps level by pressing and releasing the torch trigger in less than 3/4 seconds.

NOTE: When a remote switch is connected to the welding power source, only trigger input is functional. Amperage is controlled by the welding power source.

Application: This ability to change amperage levels without either initial slope or final slope, gives the operator the opportunity to adjust filler metal without breaking the arc.

Select Mini Logic according to Section 5-7.



5-7. Reconfiguring Trigger Hold For 4T And Mini Logic Control

1 Output Control

2 Power Switch

To reconfigure Trigger Hold, turn Off power, push and hold Output control button and turn On power switch. Hold button for approximately 7 seconds (or until software version number _ _ _ _ _ _-_clears, and meters display [SEL] [H–2].

Press Output control button to change functions. Active function will be displayed on amperage (bottom) meter.

3 Meter Displays

Meter displays for the different functions will be as shown.

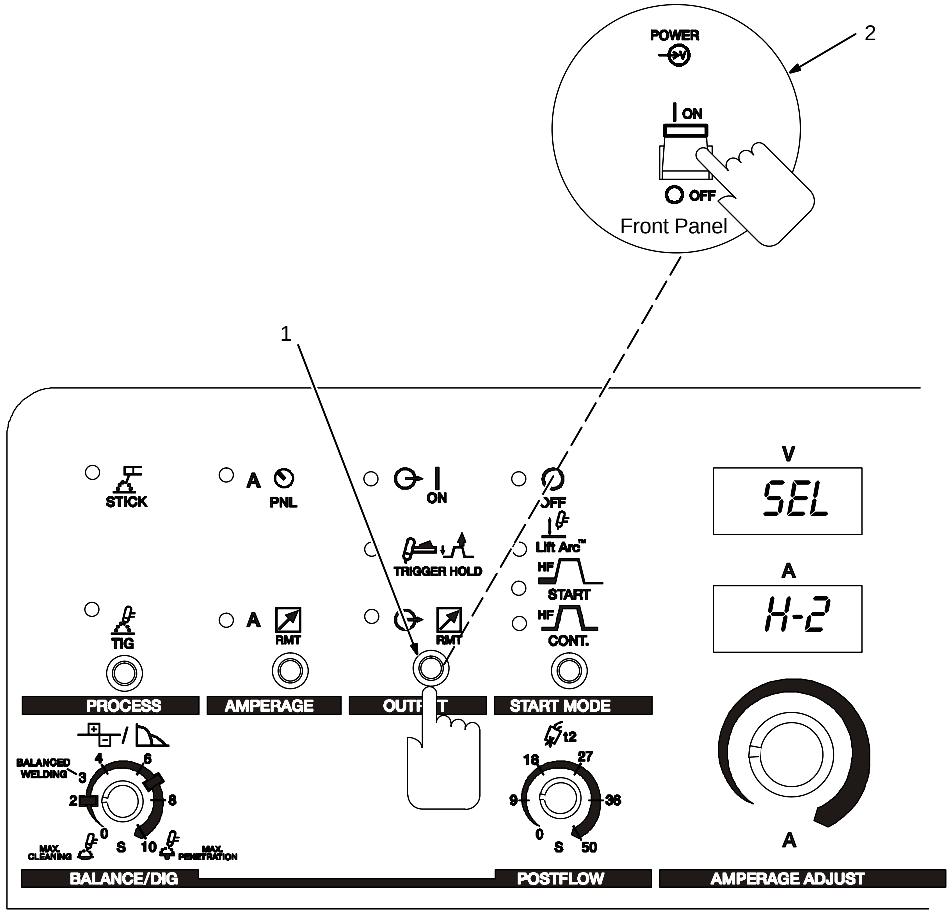
Press torch trigger or turn power Off to save setting.

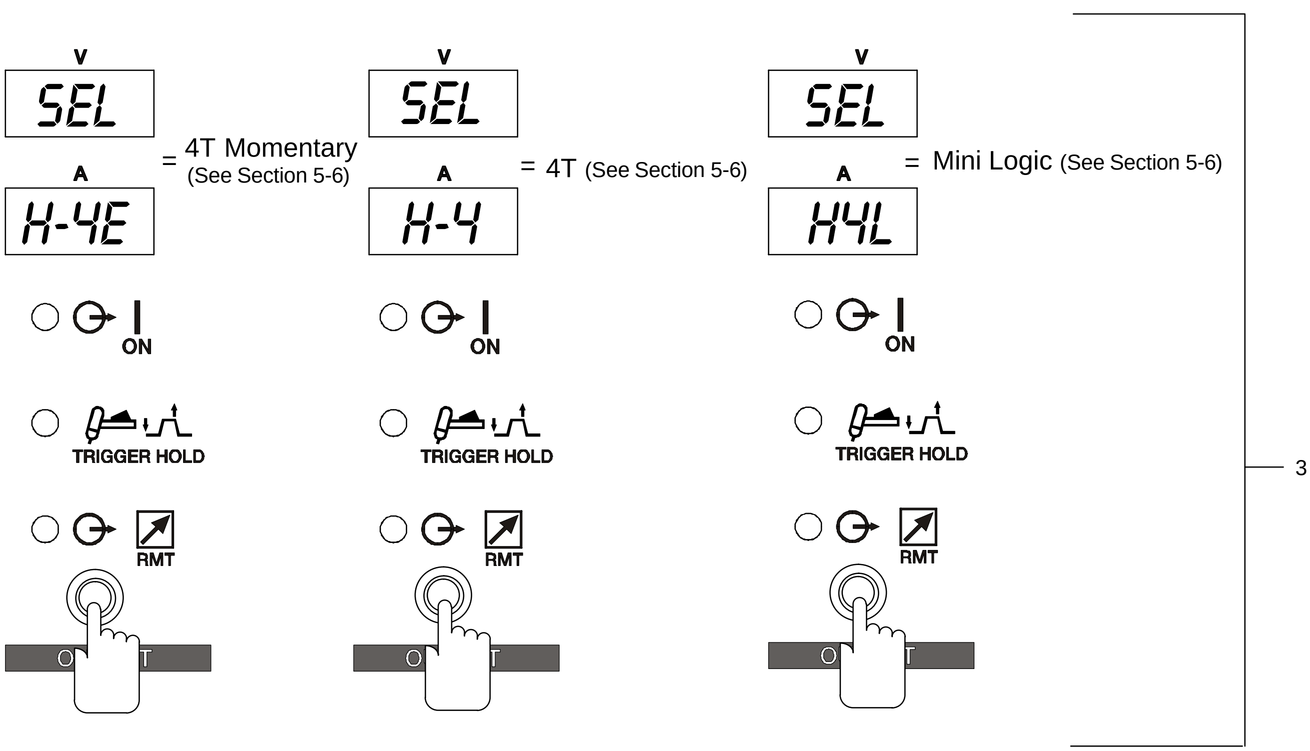
Proceed to Section 5-6 for 4T Operation.

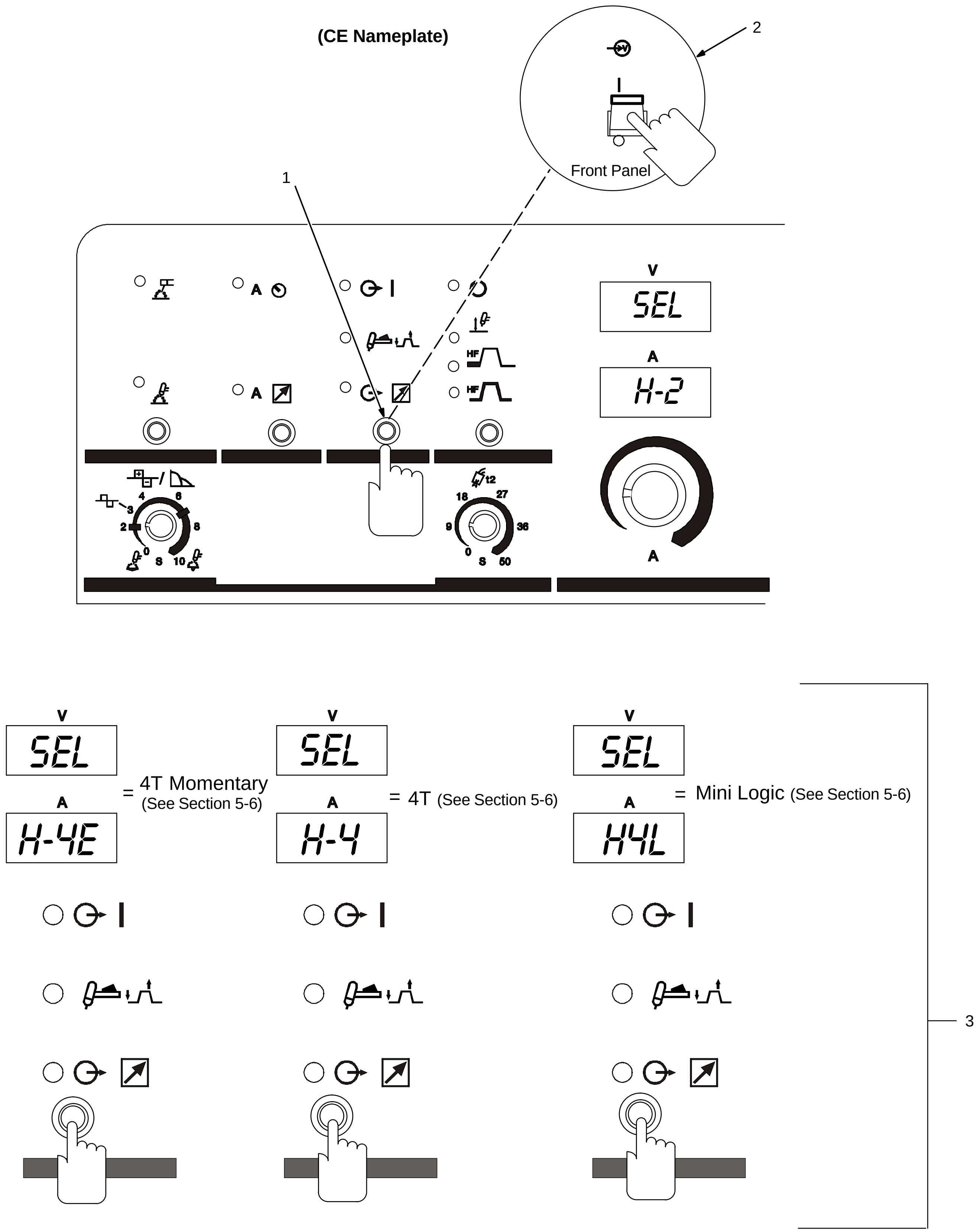
Proceed to Section 5-6 for Mini Logic operation.

Proceed to Section 5-6 for 4T Momentary operation.

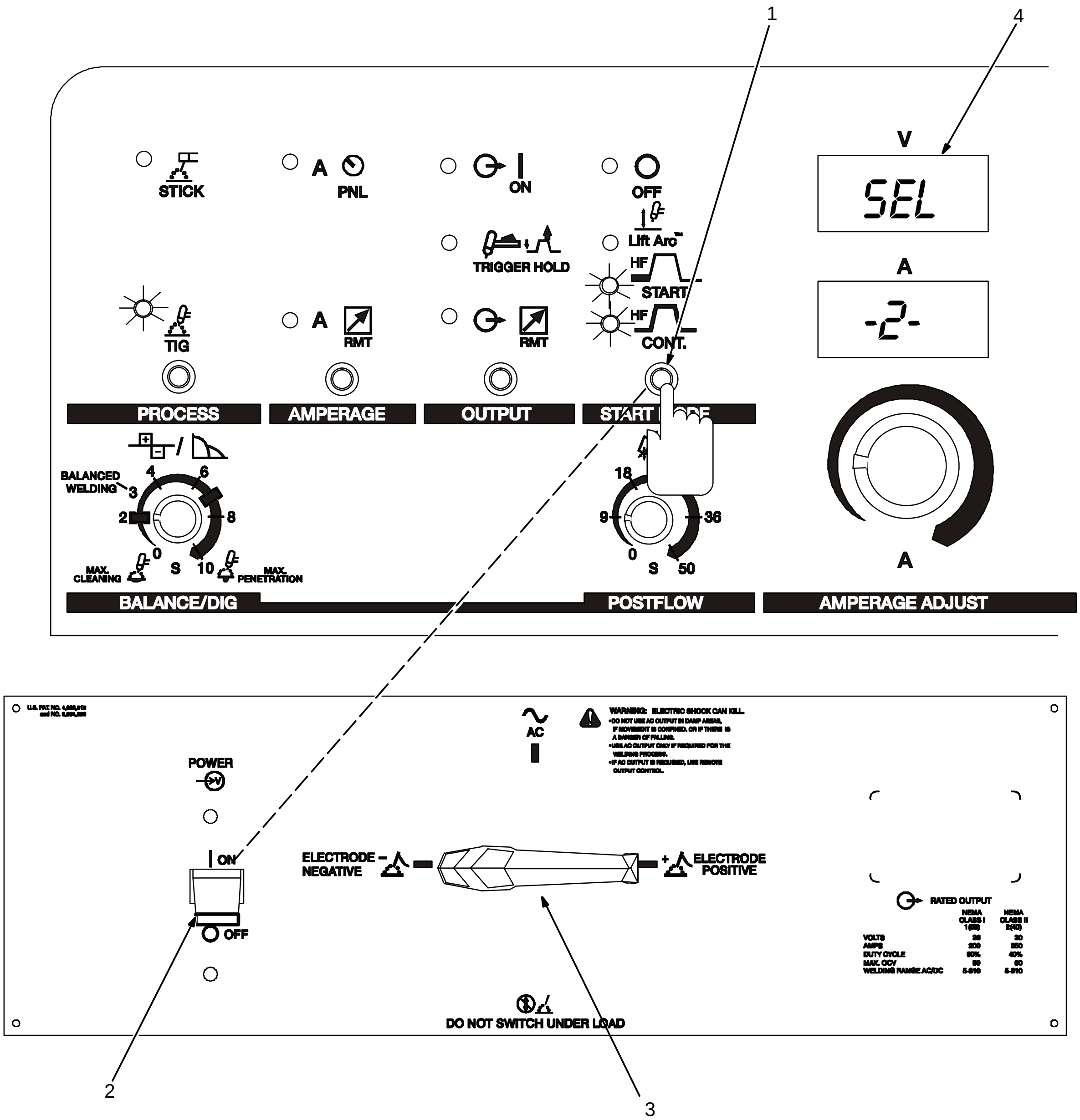
NOTE: These features are only available when optional Sequencer is installed.






(CE Nameplate)
2
Front Panel
1
V
SEL
A
H-2
A
V
SEL
A
H-4E
= 4T Momentary
(See Section 5-6)
V
SEL
A
H-4
= 4T (See Section 5-6)
V
SEL
A
H4L
= Mini Logic (See Section 5-6)
3

5-8. Selecting TIG Starting Characteristics



Use this function to select desired TIG starting characteristics.

1 Start Mode
2 Power Switch
3 Output Selector Switch
4 Meters

To select or change TIG starting characteristics, proceed as follows: turn Off power. Place Output Selector switch in desired position (each position, DCEN, AC, or DCEP has three applicable start characteristics options). Push and hold Start Mode button and turn On power. Hold button for approximately 7 seconds (or until software version number_ _ _ _ _ _-_ clears meters).

The TIG LED and all four Start LEDs will light, and the meters will display [SEL] [-2-].

Press Start Mode button again to step through the three start characteristics choices. Amperage (bottom) meter displays active choice 1= light start, 2=medium/normal start, 3=high/hot start.

Press torch trigger or turn Off power to save setting.

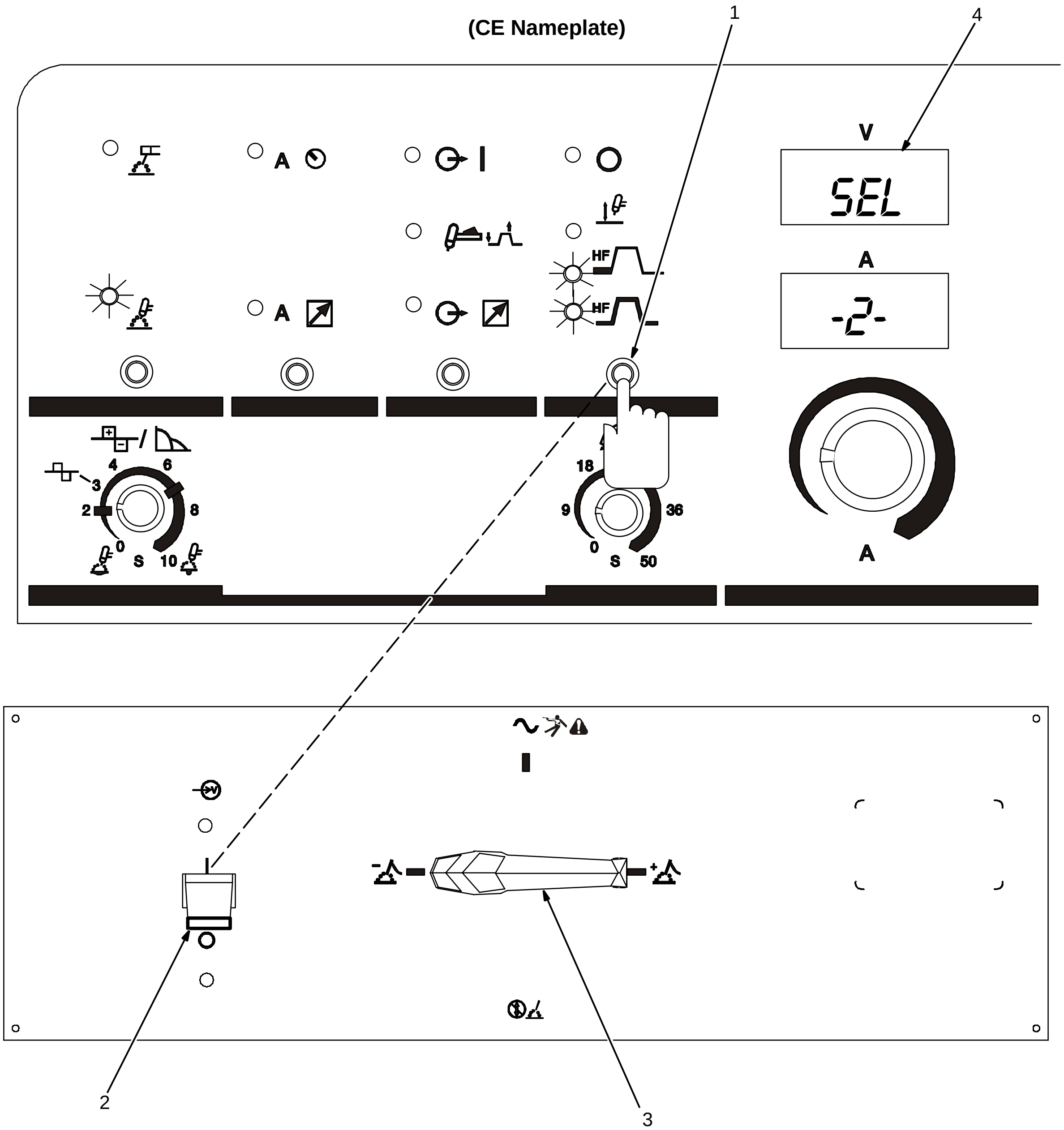
Application:

Select 1 (light/soft start) − when welding at low amperages on thin gauge material.

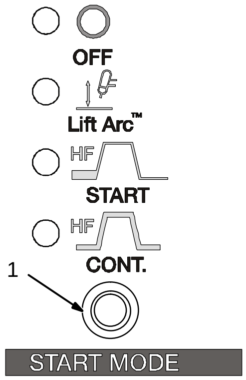
Select 2 (medium/normal start) − factory default setting used for most welding applications.

Select 3 (high/hot start) − when welding at high amperages on thick materials with a large diameter tungsten.

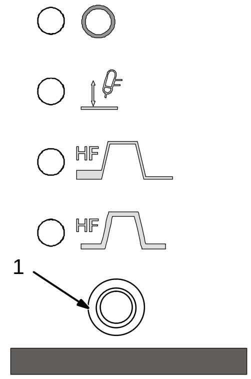
(CE Nameplate)

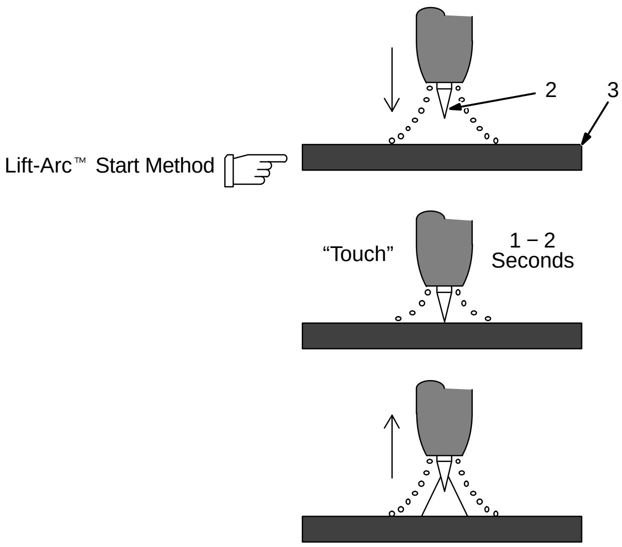


5-9. Start Mode



(CE Nameplate)





Do NOT Strike Like A Match!

1 Start Mode

For SMAW welding, press button to toggle LED to Off position.

For GTAW welding, use control to select Off for no HF, Lift-Arc™, HF for arc starting only, or continuous HF.

Application:

When Off is selected, use the scratch method to start an arc for both the SMAW and GTAW processes.

When Lift-Arc is selected, start arc as follows:

2 TIG Electrode

3 Workpiece

Touch tungsten electrode to workpiece at weld start point, enable output with torch trigger, foot control, or hand control. **Hold electrode to workpiece for 1-2 seconds**, and slowly lift electrode. An arc will form when electrode is lifted.

Shielding gas begins to flow when electrode touches work piece.

Normal open-circuit voltage is not present before tungsten electrode touches workpiece; only a low sensing voltage is present between electrode and workpiece. The solid state output contactor does not energize until after electrode is touching workpiece. This allows electrode to touch workpiece without overheating, sticking, or getting contaminated.

Application:

Lift-Arc is used for the DCEN GTAW process when HF Start method is not permitted, or to replace the scratch method.

When HF Start is selected, start arc as follows:

High frequency turns on to help start arc when output is enabled. High frequency turns off when arc is started, and turns on whenever arc is broken to help restart arc.

Application:

HF Start is used when the DCEN GTAW process is required.

When HF Continuous is selected, start arc as follows:

High frequency turns on when output is energized and remains on for duration of weld.

Application:

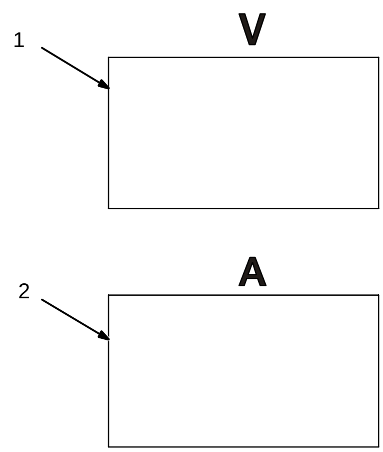
HF Continuous is used when the AC GTAW process is required.

NOTE: Lit LED indicates selected mode.

When Output Selector switch position changes, LED may change position, based upon last selection.

NOTE: Some start methods may not be available for all processes.

5-10. Meters



V 1 Voltmeter

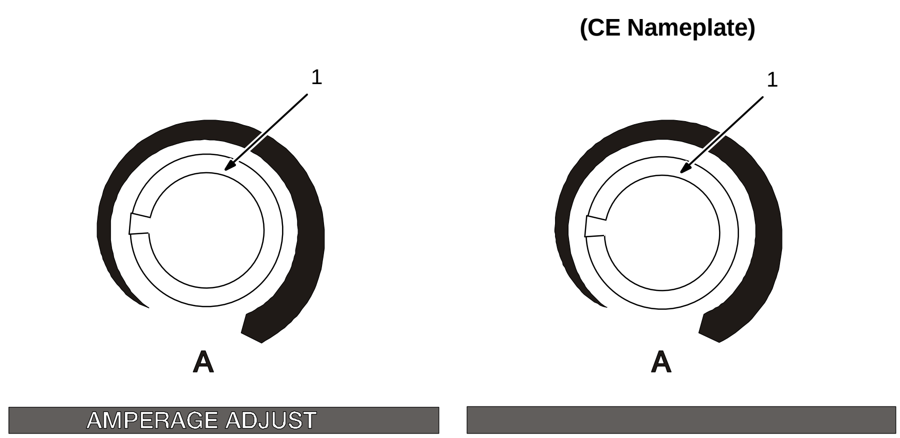
Voltmeter displays average voltage (to the nearest 0.1 V) at the weld output terminals.

A 2 Ammeter

Use meter to preset amperage. Meter displays average weld amperage output of unit to nearest ampere when welding.

NOTE: Meters are self-calibrating. No adjustment available.

5-11. Amperage Adjustment Control



1 Amperage Adjustment Control

Use control to adjust amperage, and preset amperage on ammeter (see Section 5-10). This control may be adjusted while welding.

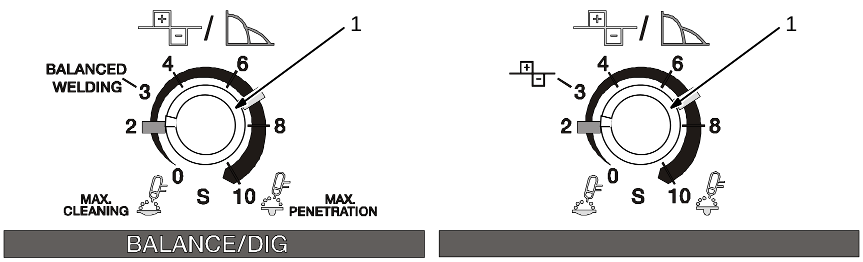
For remote amperage control, front panel control setting is the maximum amperage available. For example: If front panel control is set to 200 A, the range of the remote amperage control is 5 to 200 A.

For pulse welding, use Amperage Adjust control to select from 5−300 amps of peak amperage (see Section 5-15).

For spot welding, use Amperage Adjust control to select from 5−300 amps of peak amperage (see Section 5-19).

5-12. Balance/DIG Control

(CE Nameplate)



Balance Control Examples		
Setting	**Output Waveforms**	**Arc**
Balanced 3	50% Electrode Positive 50% Electrode Negative	
More Penetration 10	32% Electrode Positive 68% Electrode Negative	
More Cleaning 0	55% Electrode Positive 45% Electrode Negative	

1 Balance/DIG Control

Balance Control (AC GTAW):

Control changes the AC output square wave. Rotating the control towards 10 provides deeper penetration. Rotating the control towards 0 provides more cleaning action of the workpiece.

When the control is in the Balanced position, the wave shape provides equal penetration and cleaning action.

Application:

When welding on oxide forming materials such as aluminum or magnesium, excess cleaning is not necessary. To produce a good weld, only a minimal amount, approximately a 0.10 in (2.5mm) of etched zone along the weld toes is required.

Set control to 7 and adjust as necessary. Joint configuration, set-up, process variables, and oxide thickness may affect setting.

NOTE: Arc rectification can occur when welding above 200 amps and/or while welding with helium gas. If this condition occurs, increasing the Balance control towards maximum penetration, may help to restabilize the arc.

DIG Control (AC And DC SMAW):

When set at 0, short-circuit amperage at low arc voltage is the same as normal welding amperage.

When setting is increased, short-circuit amperage at low arc voltage increases.

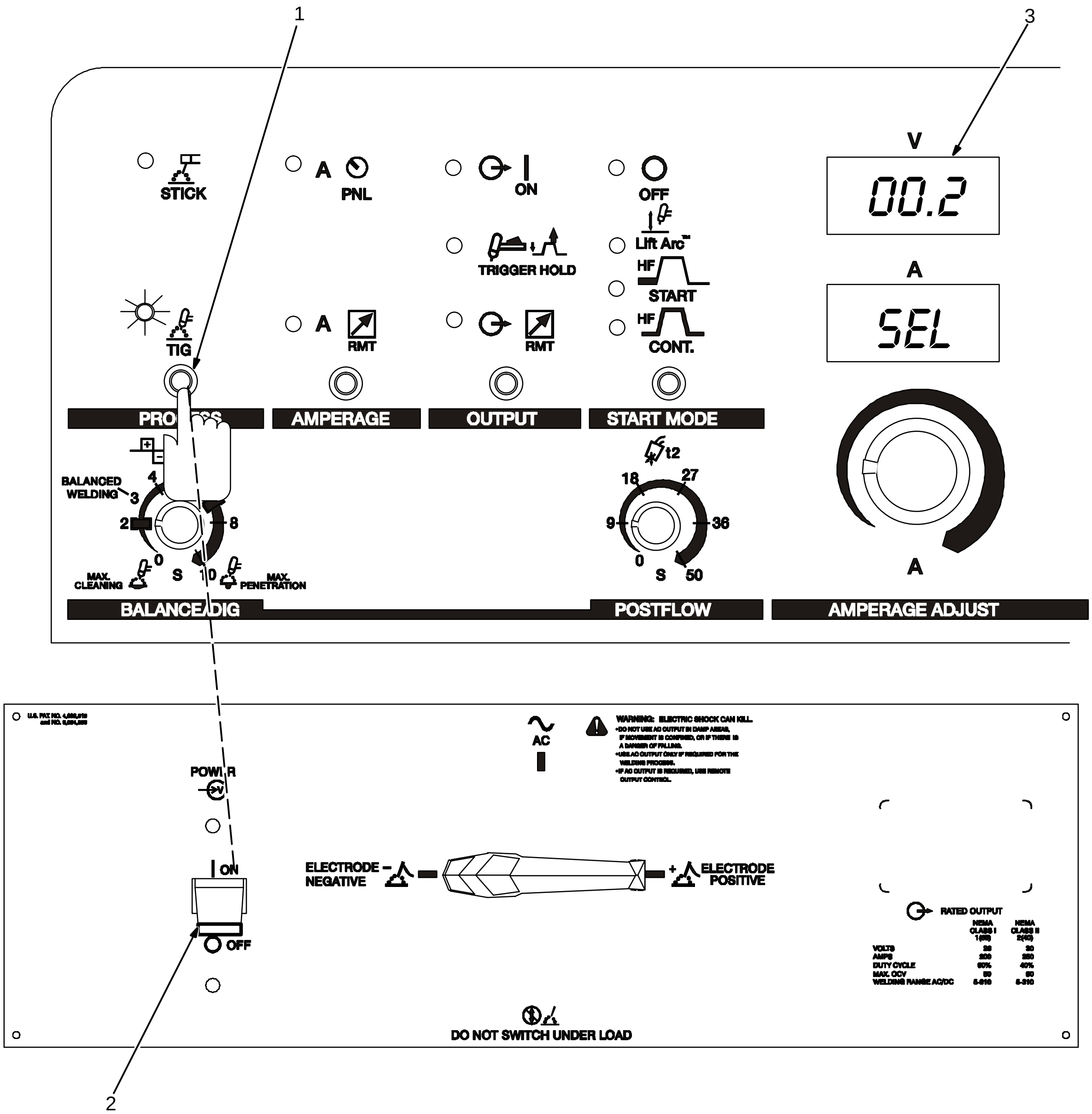
Application:

Control helps arc starting or making vertical or overhead welds by increasing amperage at low arc voltage, and reduces electrode sticking while welding.

Ref. S-0795-A

Notes

5-13. Preflow Time Control



Use control to set length of time (0.2, 0.4, 0.6, 0.8, 1.0, 2.0 or 4.0 seconds) gas flows before welding starts.

1 Process Control

2 Power Switch

3 Meters

To change preflow time, proceed as follows:

Turn power off. Push and hold Process Control button and turn On power. Hold button for approximately 7 seconds (or until software version number_ _ _ _ _ _-_ clears meters).

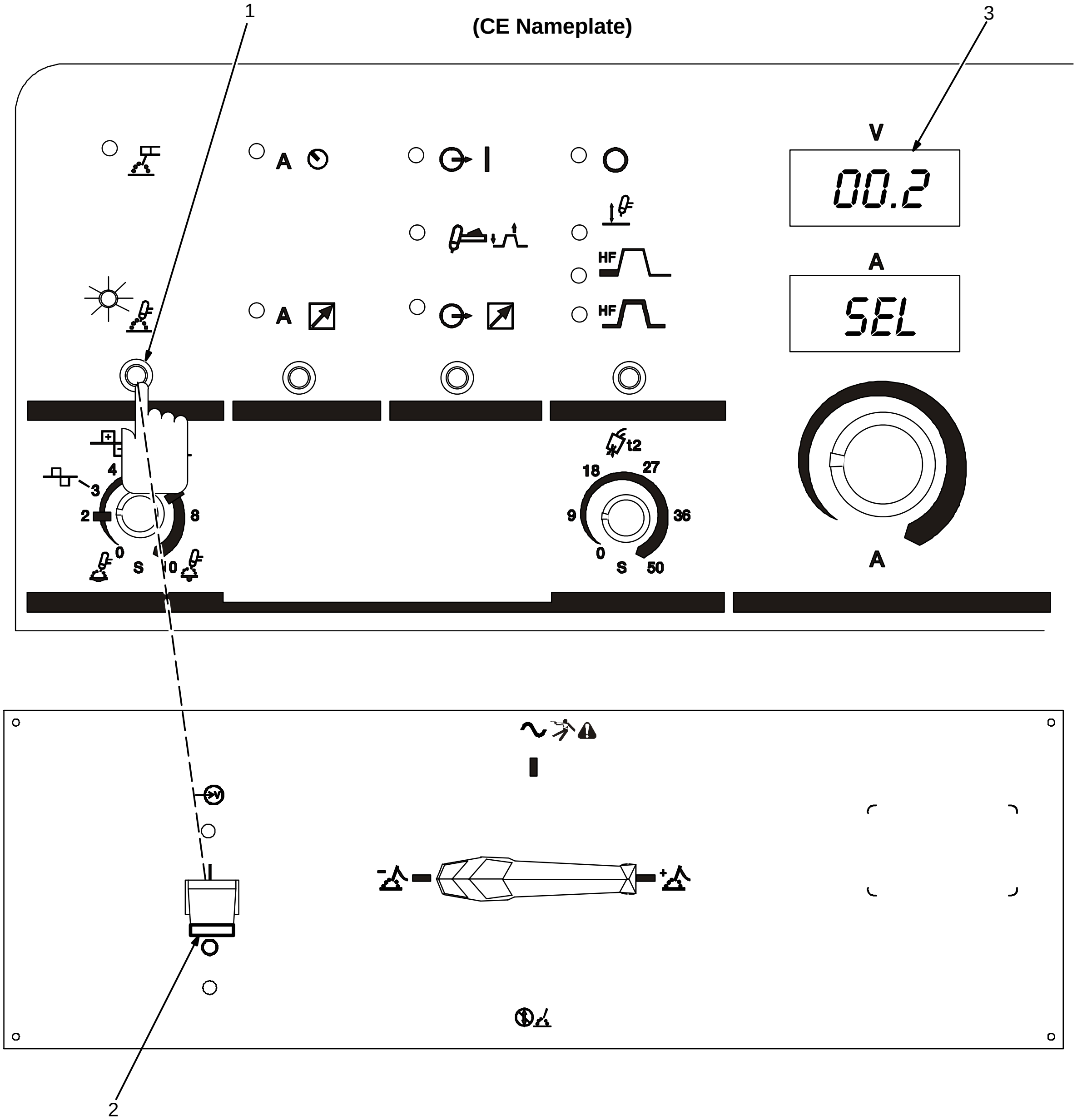
The TIG LED will light and the meters will display [0.2] [SEL]. The factory preflow default setting is 0.2 seconds. To change preflow time, press and release Process Control button until desired time is displayed on meters.

Application:

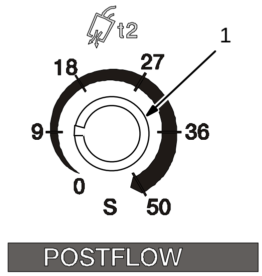
Preflow is used to purge the immediate weld area of atmosphere. Preflow also aids in consistent arc starting.

Return To Table Of Contents

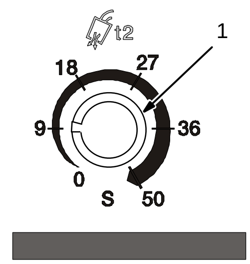
(CE Nameplate)



5-14. Postflow Time Control



(CE Nameplate)



1 Postflow Time Control

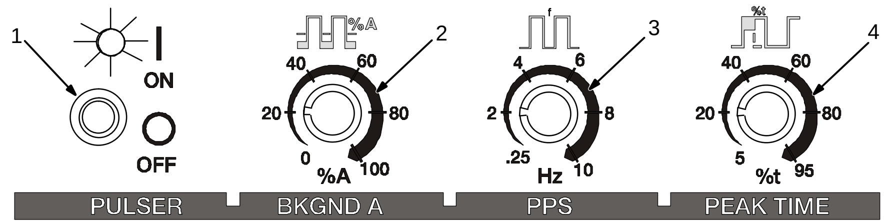
Use control to set length of time (0−50 seconds) gas flows after welding stops. It is important to set enough time to allow gas to flow until after the tungsten and weld puddle has cooled down.

Application:

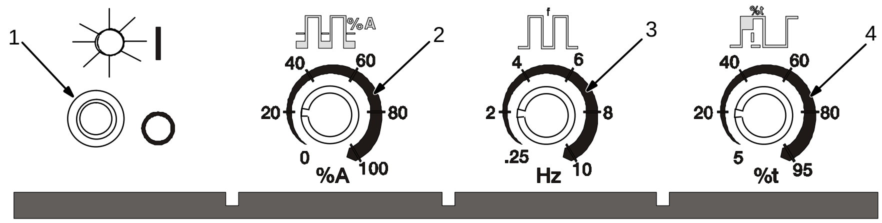
Postflow is required to cool tungsten and weld, and to prevent contamination of tungsten and weld. Increase postflow time if tungsten or weld are dark in appearance (approximately 1 second per 10 ampere of welding current).

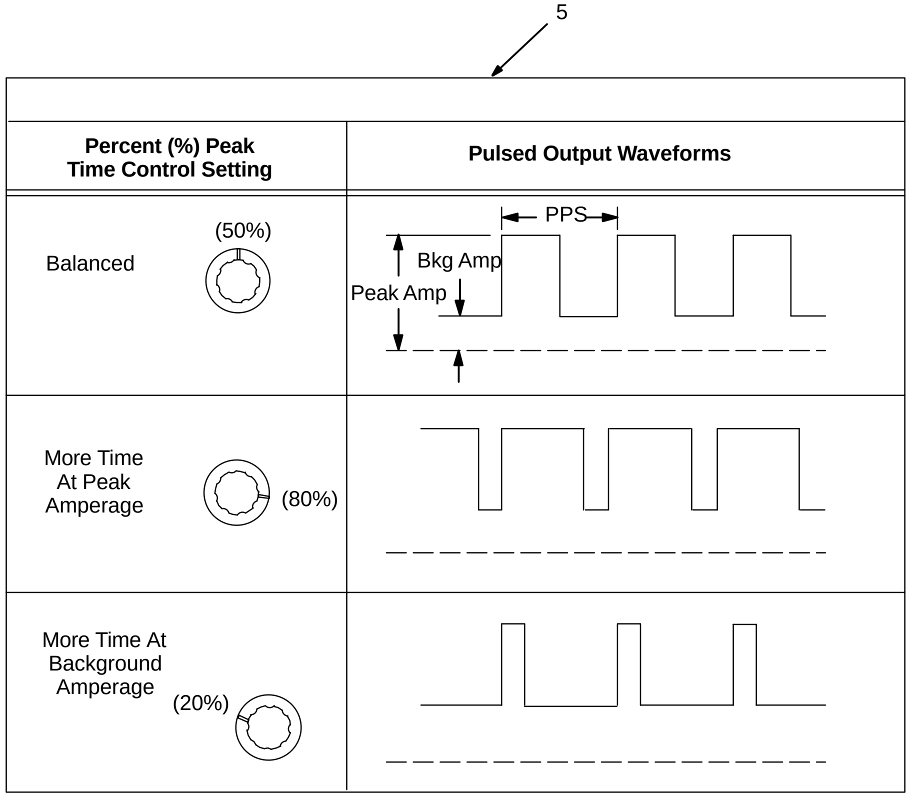
Return To Table Of Contents

5-15. Pulse Controls (Optional)



(CE Nameplate)





1 On/Off Control

Use control to turn pulse function On and Off.

2 Background Amps

Use Background Amps control to set the low pulse of the weld amperage, which cools the weld puddle and affects overall heat input. Background Amps is set as a percentage of peak amperage.

3 Pulse Frequency

Ranges from 0.25−10.0 pps (pulses per second). Control is used to determine appearance of weld bead.

4 Peak Time

A range of 5−95% of each pulse cycle can be spent at the peak amperage level.

Peak amperage (5−310 amps), is set with the Amperage Adjustment control (see Section 5-1). Peak amperage is the highest welding amperage allowed to occur in the pulse cycle. Weld penetration varies directly with peak amperage.

5 Pulsed Output Waveforms

Example shows affect changing the Peak Time control has on the pulsed output waveform.

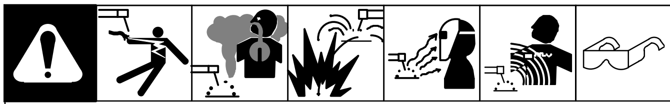
Application:

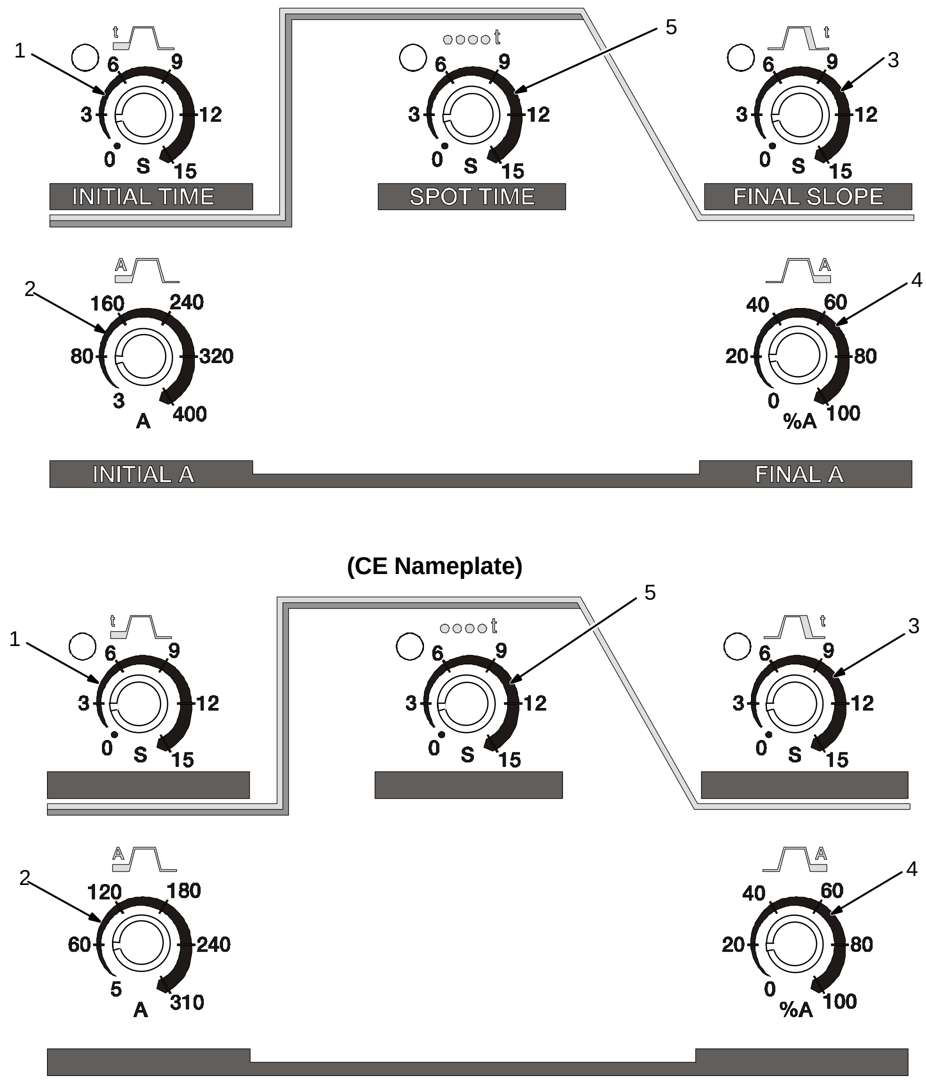
Pulsing refers to the alternating raising and lowering of the weld output at a specific rate. The raised portions of the weld output are controlled in width, height, and frequency, forming pulses of weld output. These pulses and the lower amperage level between them (called the background amperage) alternately heat and cool the molten weld puddle. The combined effect gives the operator better control of penetration, bead width, crowning, undercutting, and heat input. Controls can be adjusted while welding.

Pulsing can also be used for filler material addition technique training.

NOTE: Function is enabled, when LED is lit.

5-16. Sequence Controls (Optional)





1 Initial Time Control

See Section 5-17.

2 Initial Amperage Control

See Section 5-17.

3 Final Slope Control

See Section 5-18.

4 Final Amperage Control

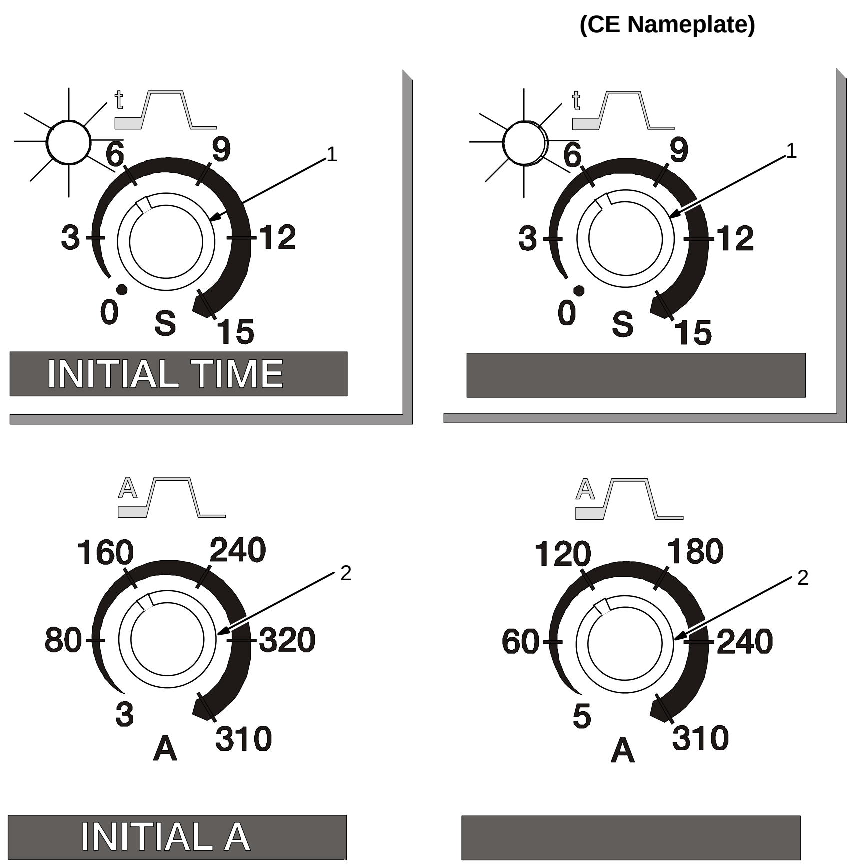
See Section 5-18.

5 Spot Time Control

See Section 5-19.

Ref. ST-196 616 / Ref. ST-196 764

5-17. Initial Time Control And Initial Amperage Control



1 Initial Time Control

Indicator light is on when Initial Time control function is active.

NOTE: Initial Sequence control function is inactive when Spot Time function is active.

Use control to select 0−15 seconds of start time.

2 Initial Amperage Control

Indicator Light is on when Initial Sequence control function is active.

NOTE: Initial Amperage control function is inactive when Spot Time function is active.

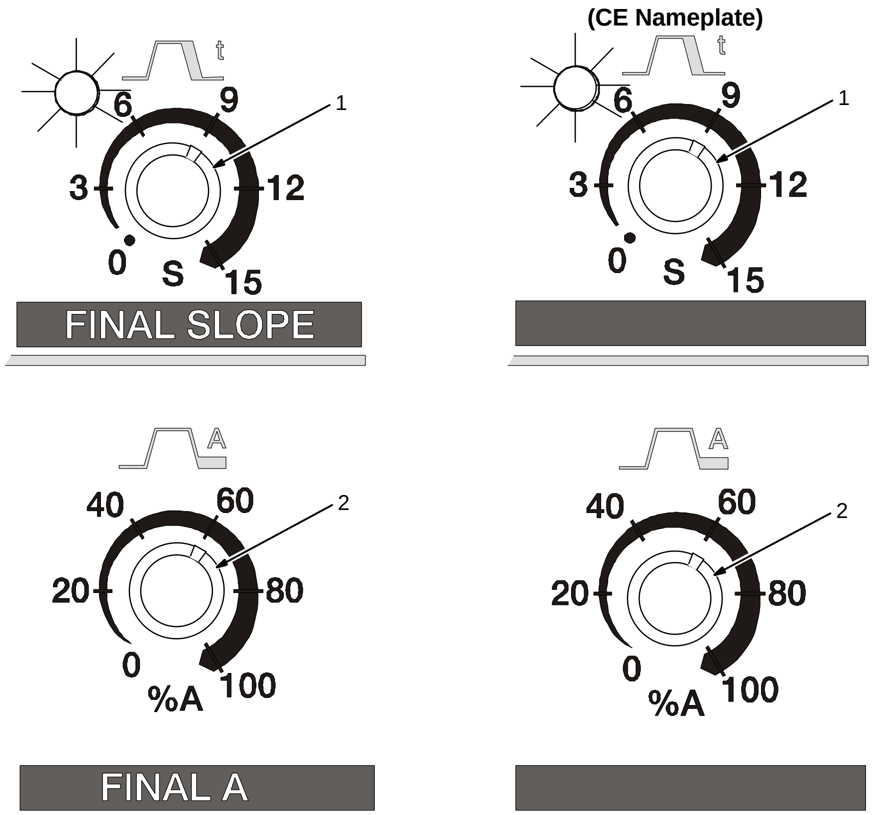
Use control to select a starting amperage (5−310 amps) that is different from the weld amperage. Note: Initial Amperage can be used with or without a remote control (Initial Amperage and Initial Time control settings will override a remote control device).

Application:

Initial Amperage can be used while GTAW welding to assist in preheating cold material prior to depositing filler material, or to ensure a soft start. Initial Amperage can also be used for SMAW to ensure a more consistent arc strike.

NOTE: Function is enabled, when LED is lit.

5-18. Final Slope Control And Final Amperage Control



1 Final Slope Control

Indicator light is on when Final Slope control function is active.

Note: Final Slope control function is inactive when Spot Time function is active.

Use control to reduce amperage over a set period of time (0−15 seconds) at the end of the weld cycle when NOT using a remote current control.

2 Final Amperage Control

Indicator light is on when Final Amperage control function is active.

Note: Final Amperage control function is inactive when Spot Time function is active (see Section 5-19).

Final amperage is the amperage to which weld amperage has sloped down to (0−100% of amperage set on Amperage Adjust control).

Application:

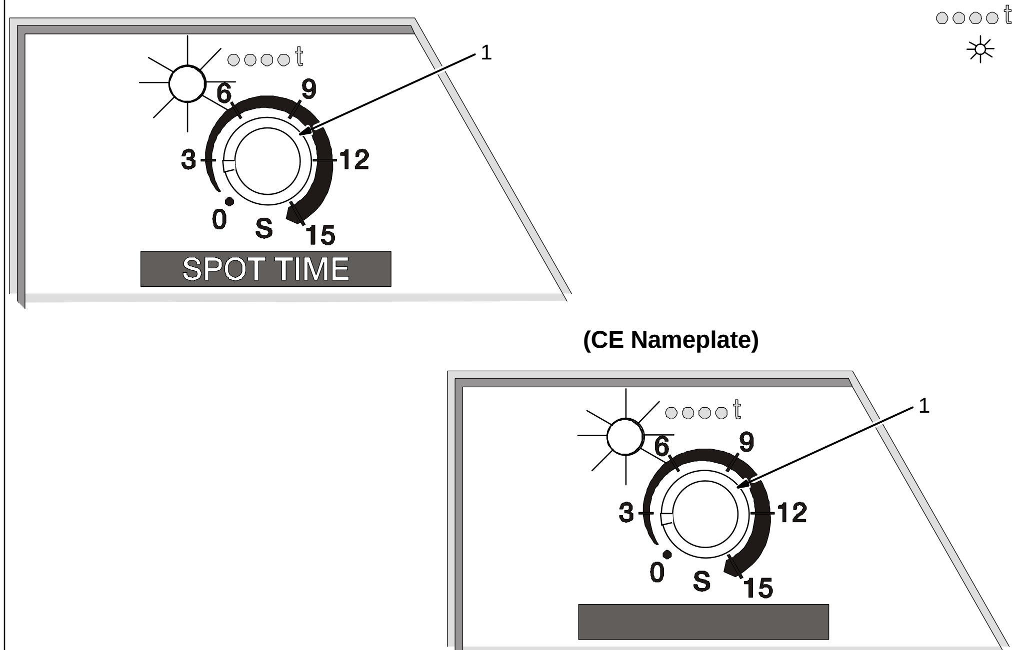
Final Slope should be used while GTAW welding materials that are crack sensitive, and/or the operator wants to eliminate the crater at the end of the weld.

Note: This applies if the operator is using an on/off only type control to start and stop the welding process.

Note: Do not use this function with a foot or finger amperage control.

NOTE: Function is enabled, when LED is lit.

5-19. Spot Time Control



1 Spot Time Control

Indicator light is on when Spot Time function is active. When Spot Time function is active, Initial Time, Initial Amperage, Final Slope, and Final Amperage functions are inactive (see Section 5-16).

Used with the (GTAW) TIG Spot process, generally with a direct current electrode negative (DCEN) set-up.

Use control to select 0−15 seconds of spot time.

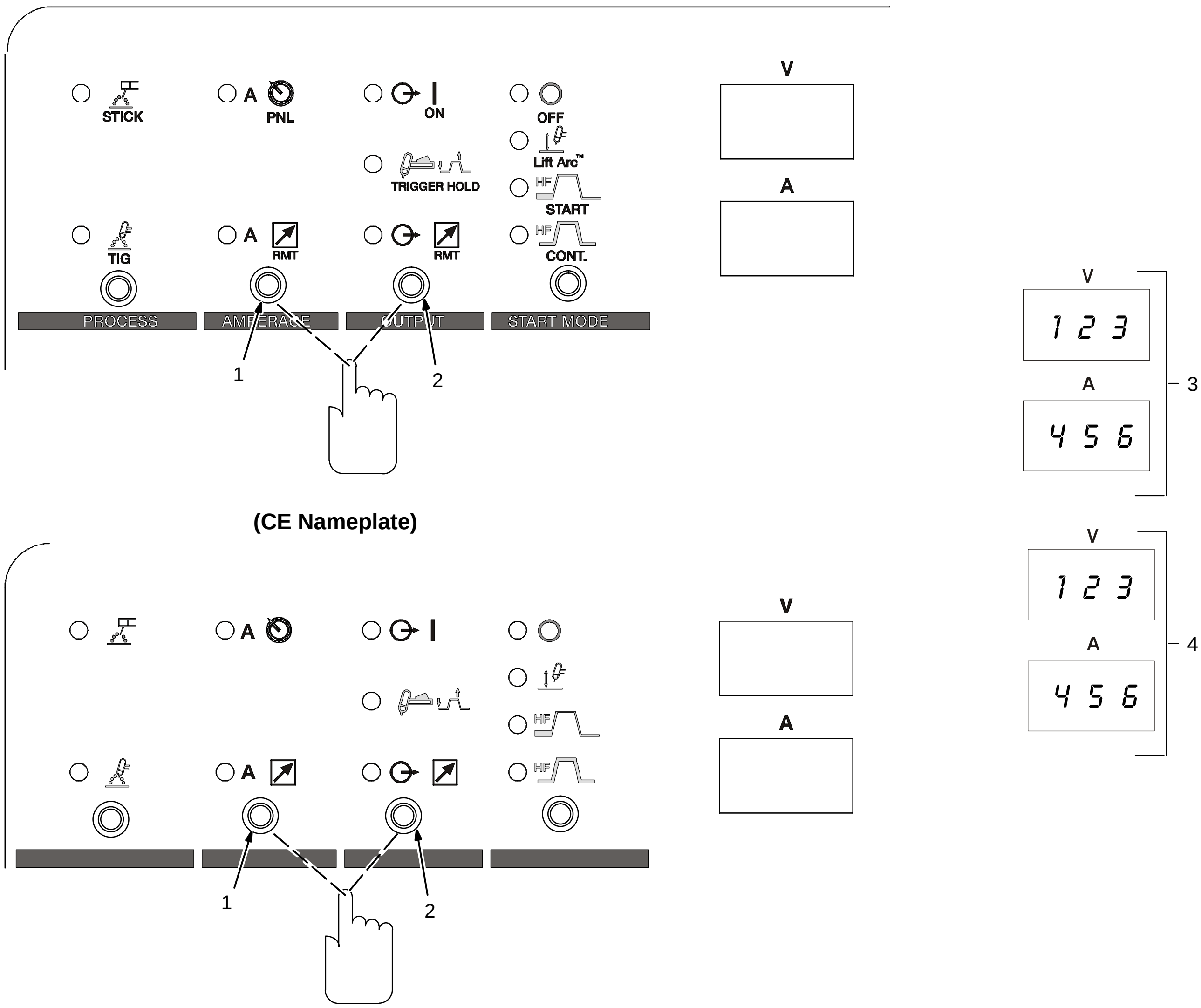
Use Amperage Adjust control (see Section 5-11) to set amperage.

Application:

TIG spot welding is used for joining thinner materials that are in close contact with the fusion method. A good example would be joining coil ends.

NOTE: Function is enabled, when LED is lit.

5-20. Timer/Cycle Counter



1 Amperage Control

2 Output Control (Contactor)

To read timer/cycle counter, hold Amperage and Output (contactor) buttons while turning on power.

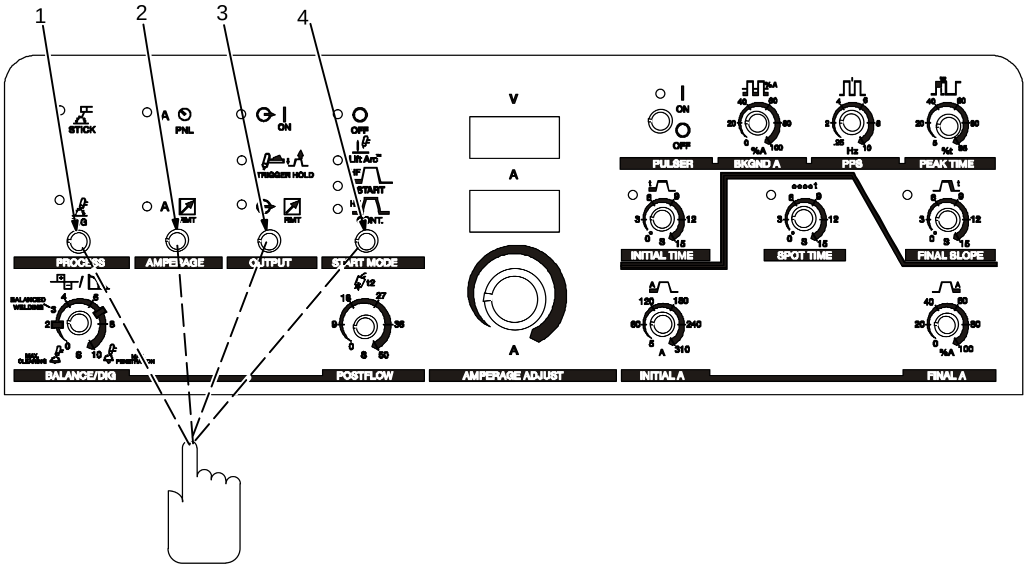
3 Timer Display

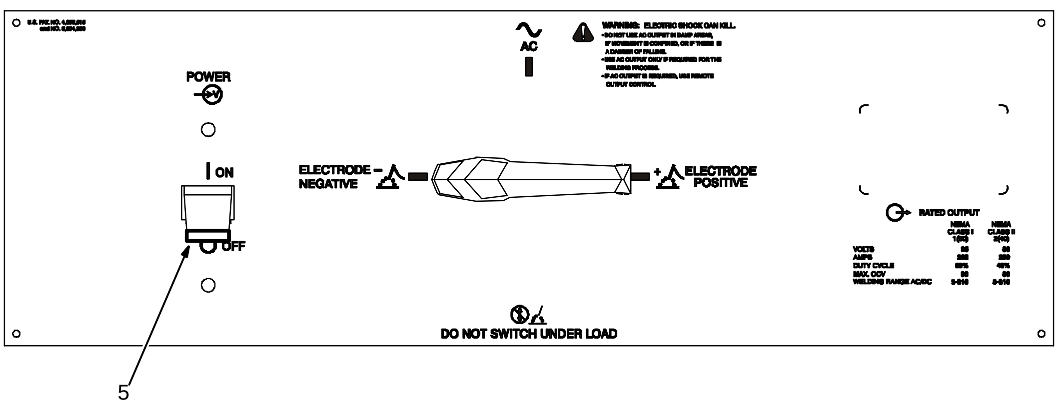
The hours and minutes are displayed on the volt and amp meters for the first five seconds, and are read as 1, 234 hours and 56 minutes.

4 Cycle Display

The cycles are displayed on the volt and amp meters for the next five seconds, and are read as 123, 456 cycles.

5-21. Resetting Unit To Factory Default Settings (All Models)



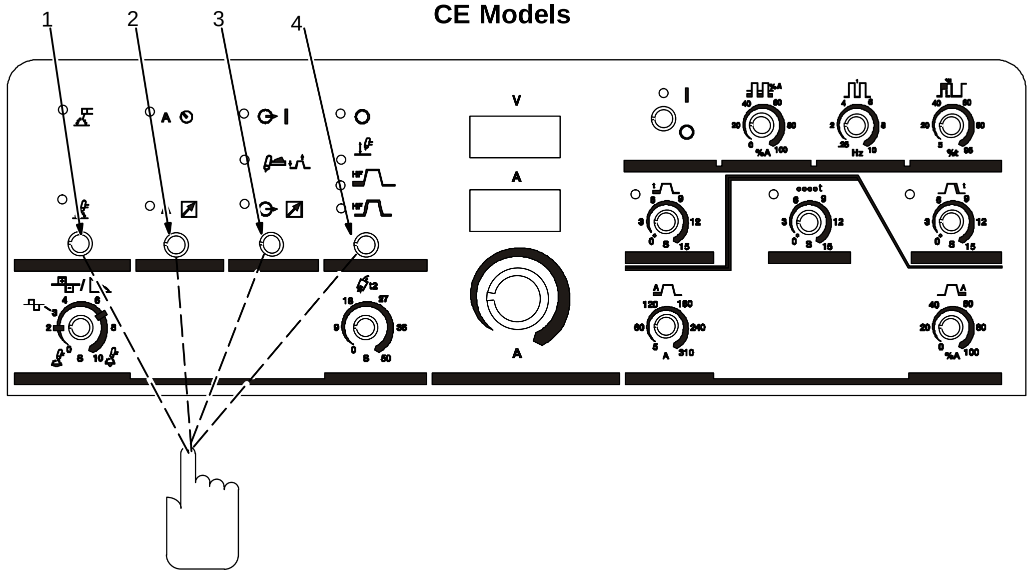


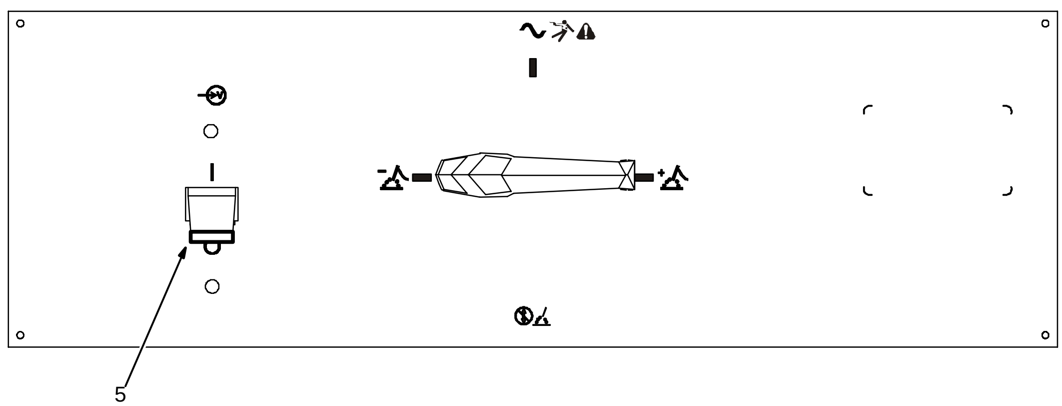
1 Process Control
2 Amperage Control
3 Output Control
4 Start Control

5 Power Switch

To reset all welding power source functions to original factory settings, turn power off. Push and hold the Process, Amperage, Output and Start controls and turn On power. Hold switch pads for approximately 7 seconds (or until software version number _ _ _ _ _ _-_clears meters).

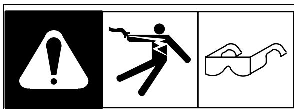
CE Models





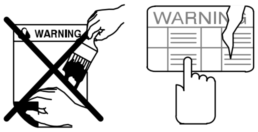
SECTION 6 − MAINTENANCE & TROUBLESHOOTING

6-1. Routine Maintenance

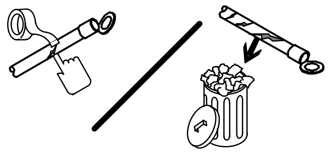


▲ **Disconnect power before maintaining.**

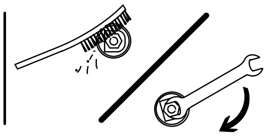
3 Months



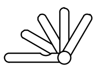
Replace Unreadable Labels



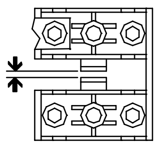
Repair Or Replace Cracked Weld Cables

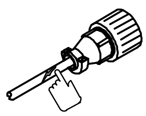


Clean And Tighten Weld Terminals



Adjust Spark Gaps

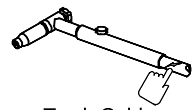




14-Pin Cord



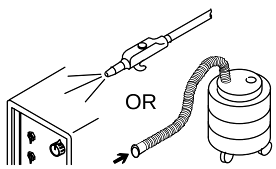
Gas Hose



Torch Cable

Replace Cracked Parts

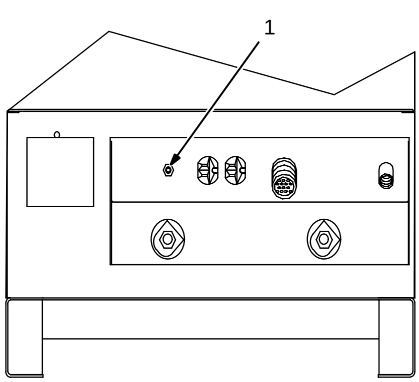
6 Months



Blow Out Or Vacuum Inside,
During Heavy Service,
Clean Monthly

6-2. Circuit Breaker CB1





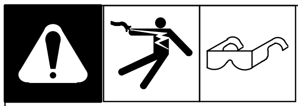
▲ **Turn off power before resetting breaker.**

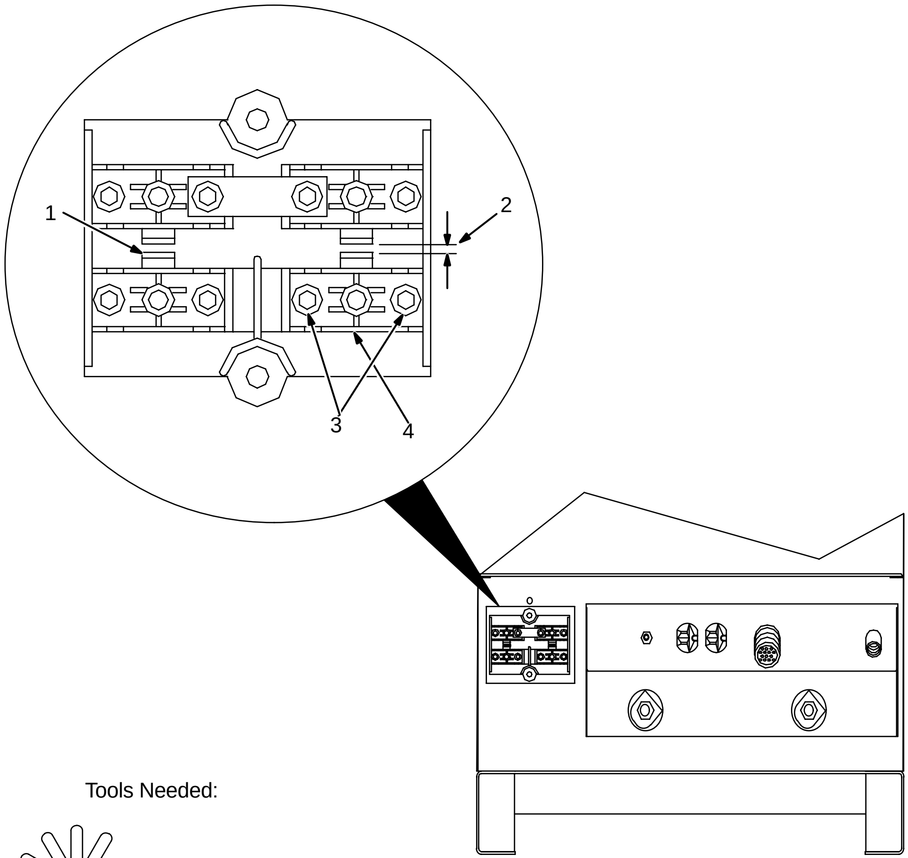
1 Circuit Breaker CB1

If CB1 opens, high frequency and output to the 115 volts ac duplex receptacle stop. Press button to reset breaker.

Ref. ST-801 972-C

6-3. Adjusting Spark Gaps





▲ **Turn Off welding power source and disconnect and lockout/tagout input power before adjusting spark gaps.**

Open access door.

1 Tungsten End Of Point

Replace point if tungsten end disappears; do not clean or dress tungsten.

2 Spark Gap

Normal spark gap is 0.012 in (0.305 mm).

If adjustment is needed, proceed as follows:

3 Adjustment Screws

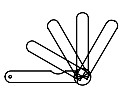
Loosen screws. Place gauge of proper thickness in spark gap.

4 Pressure Point

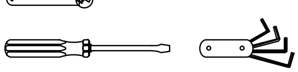
Apply slight pressure at point until gauge is held firmly in gap. Tighten screws. Adjust other gap.

Reinstall access door.

Tools Needed:



0.012 in (0.305 mm)



5/32 in

Ref. ST-801 972-C / Ref. S-0043

6-4. Voltmeter/Ammeter Help Displays

☞ *All directions are in reference to the front of the unit. All circuitry referred to is located inside the unit.*

0 Help 0 Display

Indicates a short in the thermal protection circuitry located on the transformer of the unit. If this display is shown, contact a Factory Authorized Service Agent.

1 Help 1 Display

An SCR overcurrent condition has occurred. Turn power off and back on to correct condition. If problem continues, contact a Factory Authorized Service Agent.

2 Help 2 Display

Indicates a malfunction in the thermal protection circuitry located on the transformer of the unit. If this display is shown, contact a Factory Authorized Service Agent.

3 Help 3 Display

Indicates the transformer of the unit has overheated. The unit has shut down to allow the fan to cool it (see Section 4-4). Operation will continue when the unit has cooled.

4 Help 4 Display

Indicates a malfunction in the thermal protection circuitry located on the rectifier assembly of the unit. If this display is shown, contact a Factory Authorized Service Agent.

5 Help 5 Display

Indicates the rectifier assembly of the unit has overheated. The unit has shut down to allow the fan to cool it (see Section 4-4). Operation will continue when the unit has cooled.

6 Help 6 Display

Not used.

7 Help 7 Display

Not used.

8 Help 8 Display

Not used.

9 Help 9 Display

Indicates a short in the thermal protection circuitry located on the rectifier assembly of the unit. If this display is shown, contact a Factory Authorized Service Agent.

10 Help 10 Display

Indicates Remote Output control is activated. Release Remote Output control to clear help message.

11 Help 11 Display

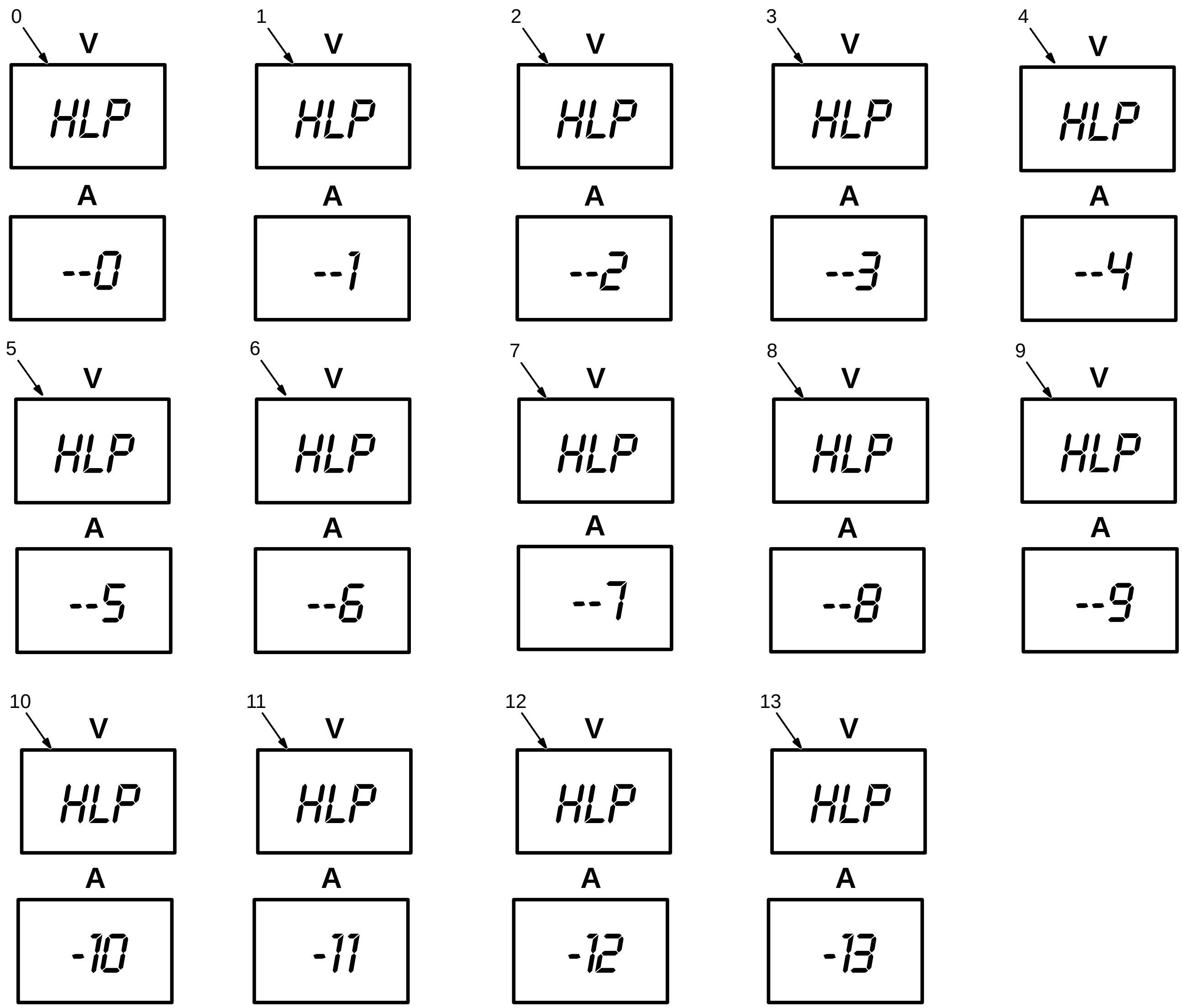
Indicates Output Selector switch is not in correct position (see Section 5-2).

12 Help 12 Display

Indicates a non-allowable set-up on the front panel.

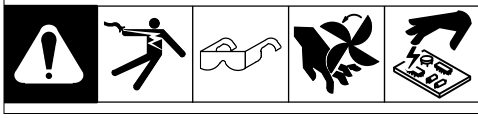
13 Help 13 Display

AIC option, output enable signal broken causing weld output to stop, but gas continues to flow.



Return To Table Of Contents

6-5. Troubleshooting



NOTE: The remedies listed below are recommendations only. If these remedies do not fix the trouble with your unit, have a Factory Authorized Service Agent check unit.
There are no user serviceable parts inside unit.

Refer to Section 6-4 for any Help (HLP) message displayed on voltmeter/ammeter.

Trouble	Remedy
No weld output; unit completely inoperative.	Place line disconnect switch in On position (see Section 4-18).
	Check and replace line fuse(s), if necessary (see Section 4-18).
	Check for proper input power connections (see Section 4-18).
	Check for proper jumper link position (see Section 4-17).
No weld output; unit on.	If using remote control, place Output control in Remote 14 position, and make sure remote control is connected to Remote 14 receptacle. If remote is not being used, place Output control in On position (see Section 5-1).
	Check, repair, or replace remote control.
	Have Factory Authorized Service Agent check unit.
Unit provides only maximum or minimum weld output.	Make sure Amperage control is in proper position (see Section 5-1).
	Have Factory Authorized Service Agent check unit.
Erratic or improper weld output.	Use proper size and type of weld cable (see Section 4-6).
	Clean and tighten all weld connections.
	Check position of Output Selector control (see Section Figure 5-1).
	If using remote control, check position of Amperage Adjustment control (see Section 5-1).
No control of weld output.	If using remote control, place Output control in Remote 14 position, and make sure remote control is connected to Remote 14 receptacle. If remote is not being used, place Output control in On position (see Section 5-1).
	Make sure Amperage control is in proper position (see Section 5-1).
No output from duplex receptacle RC2 and no high frequency.	Reset circuit breaker CB1 (see Section 6-2).
Lack of high frequency; difficulty in starting GTAW arc.	Reset circuit breaker CB1 (see Section 6-2).
	Select proper size tungsten.
	Be sure torch cable is not close to any grounded metal.
	Check cables and torch for cracked insulation or bad connections. Repair or replace.
	Check spark gaps (see Section 6-3).
Wandering arc − poor control of direction of arc.	Reduce gas flow rate.
	Select proper size tungsten.
	Properly prepare tungsten.
Tungsten electrode oxidizing and not remaining bright after conclusion of weld.	Shield weld zone from drafts.
	Increase postflow time.
	Check and tighten all gas fittings.
	Properly prepare tungsten.
	Check for water in torch, and repair torch if necessary.
Fan not operating.	Unit equipped with Fan-On-Demand™. Fans run only when necessary. Unit equipped with circuitry to protect against overheating.

SECTION 7 − ELECTRICAL DIAGRAM

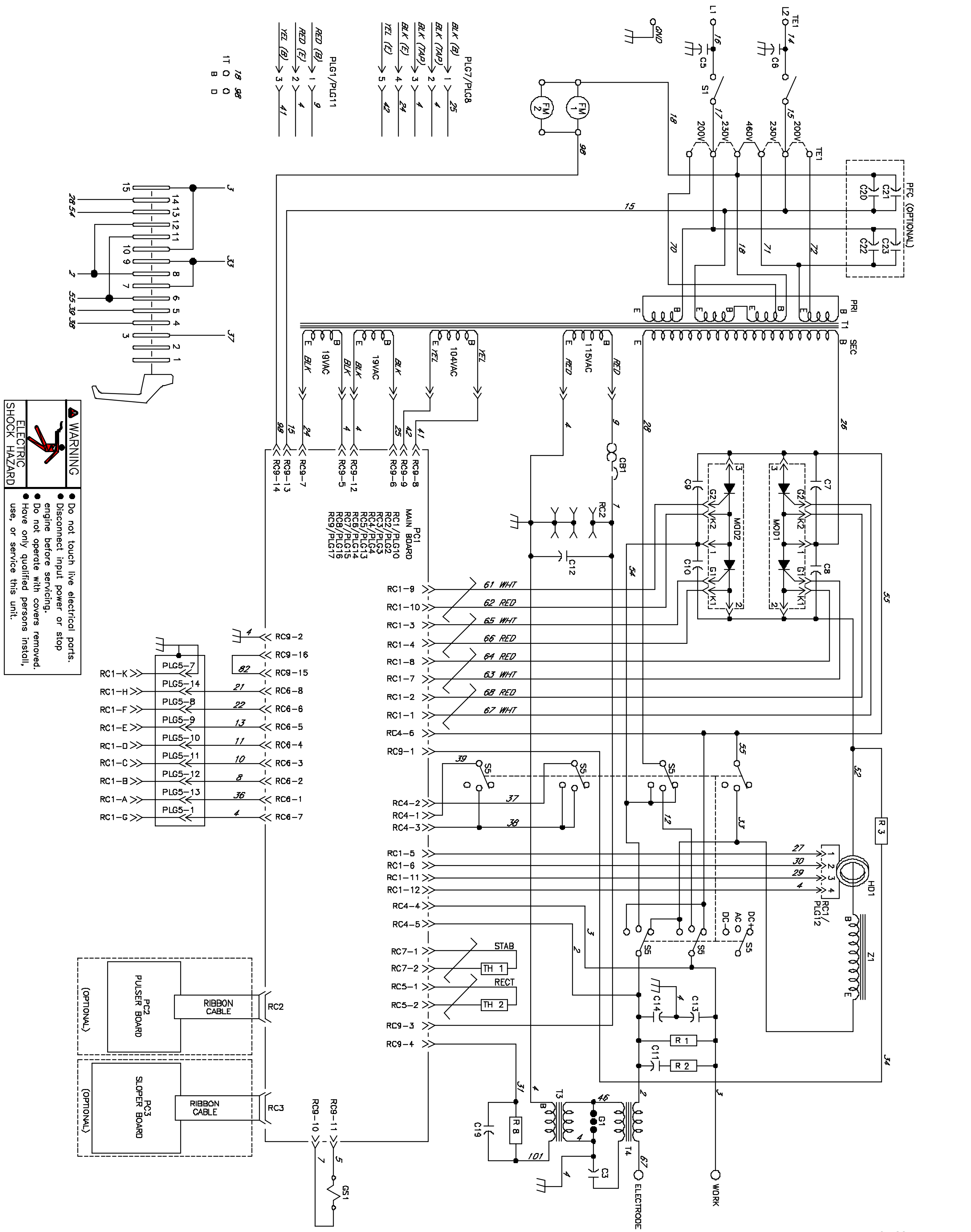
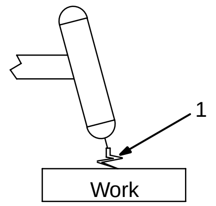


Figure 7-1. Circuit Diagram All Models

SECTION 8 − HIGH FREQUENCY

8-1. Welding Processes Requiring High Frequency



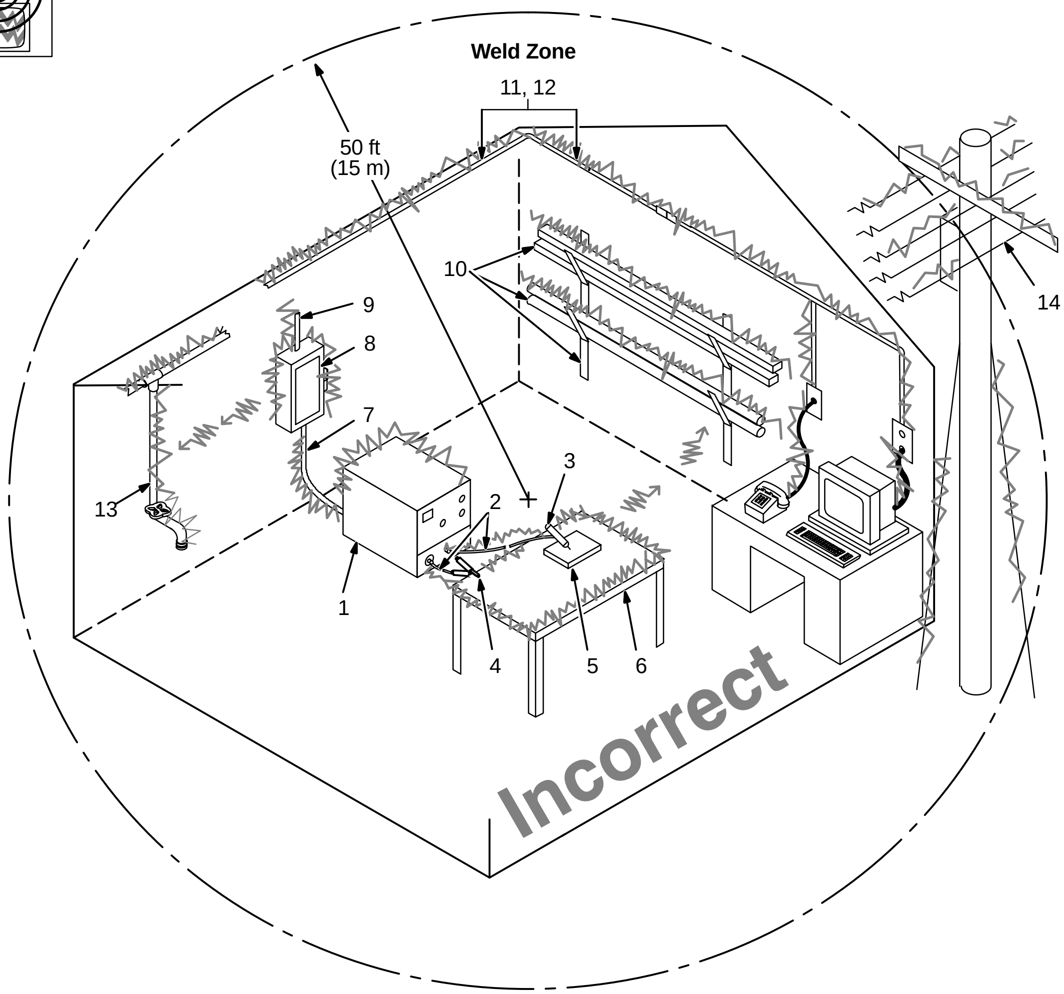
TIG

1 High-Frequency Voltage

TIG − helps arc jump air gap between torch and workpiece and/or stabilize the arc.

high_freq 12/96 − S-0693

8-2. Incorrect Installation



Sources of Direct High-Frequency Radiation

1 High-Frequency Source (welding power source with built-in HF or separate HF unit)
2 Weld Cables
3 Torch
4 Work Clamp
5 Workpiece
6 Work Table

Sources of Conduction of High Frequency

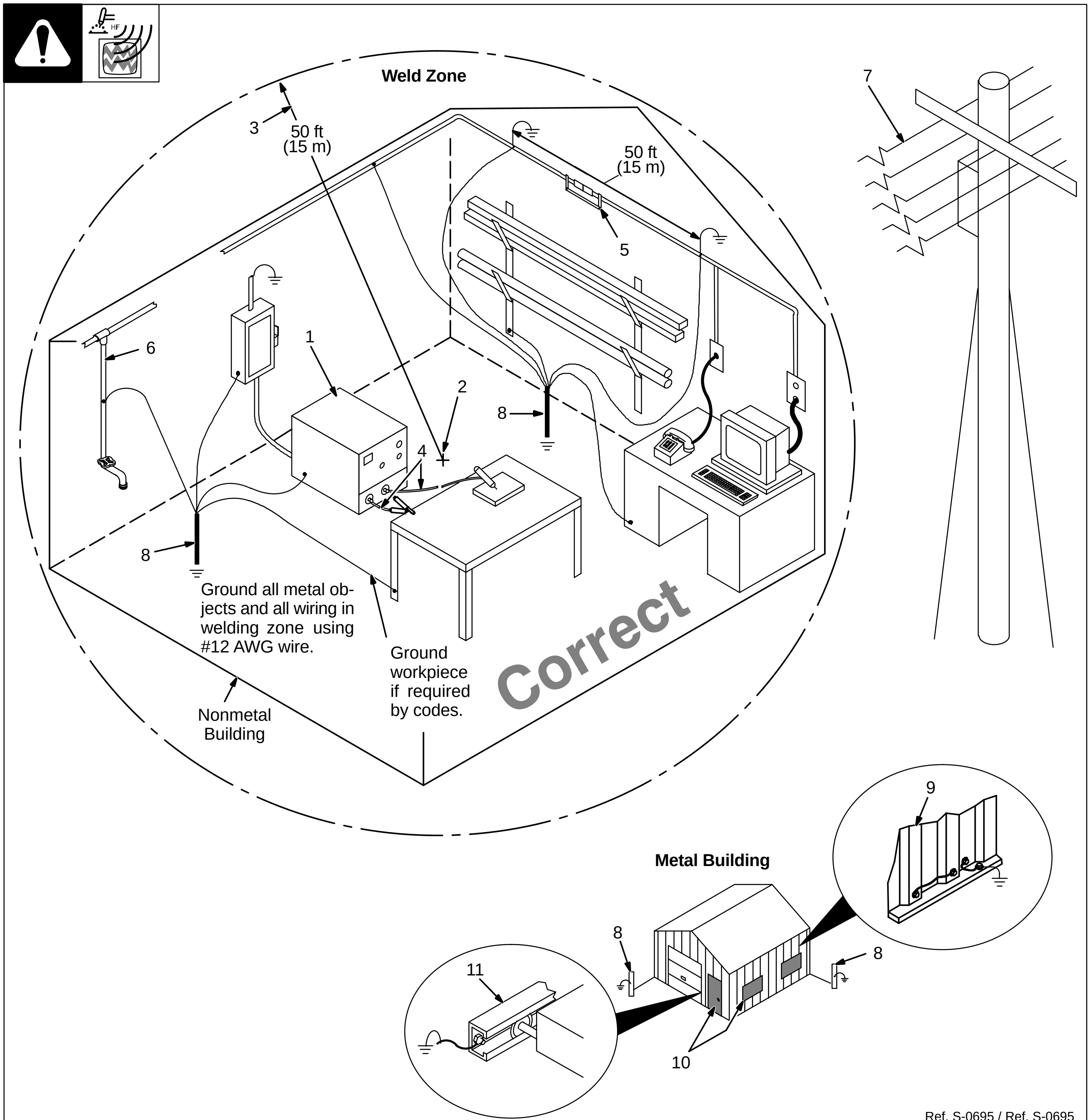
7 Input Power Cable
8 Line Disconnect Device
9 Input Supply Wiring

Sources of Reradiation of High Frequency

10 Ungrounded Metal Objects
11 Lighting
12 Wiring
13 Water Pipes and Fixtures
14 External Phone and Power Lines

S-0694

8-3. Correct Installation



1 High-Frequency Source (welding power source with built-in HF or separate HF unit)

Ground metal machine case, work output terminal, line disconnect device, input supply, and worktable.

2 Center Point of Welding Zone

Midpoint between high-frequency source and welding torch.

3 Welding Zone

A circle 50 ft (15 m) from center point in all directions.

4 Weld Output Cables

Keep cables short and close together.

5 Conduit Joint Bonding and Grounding

Electrically join (bond) all conduit sections using copper straps or braided wire. Ground conduit every 50 ft (15 m).

6 Water Pipes and Fixtures

Ground water pipes every 50 ft (15 m).

7 External Power or Telephone Lines

Locate high-frequency source at least 50 ft (15 m) away from power and phone lines.

8 Grounding Rod

Consult the National Electrical Code for specifications.

Metal Building Requirements

9 Metal Building Panel Bonding Methods

Bolt or weld building panels together, install copper straps or braided wire across seams, and ground frame.

10 Windows and Doorways

Cover all windows and doorways with grounded copper screen of not more than 1/4 in (6.4 mm) mesh.

11 Overhead Door Track

Ground the track.

SECTION 9 − SELECTING AND PREPARING TUNGSTEN ELECTRODE FOR DC OR AC WELDING

ac/dc_gtaw 2/2000

▲ **Whenever possible and practical, use DC weld output instead of AC weld output.**

9-1. Selecting Tungsten Electrode (Wear Clean gloves To Prevent Contamination Of Tungsten)

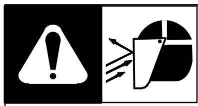
Electrode Diameter	Amperage Range - Gas Type♦ - Polarity			
	DC − Argon − Electrode Negative/Straight Polarity	**DC − Argon − Electrode Positive/Reverse Polarity**	**AC − Argon**	**AC − Argon − Balanced Wave**
2% Ceria (Orange Band), 1.5% Lanthanum (Gray Band), Or 2% Thorium (Red Band) Alloy Tungstens				
.010”	Up to 25	*	Up to 20	Up to 15
.020”	15-40	*	15-35	5-20
.040”	25-85	*	20-80	20-60
1/16”	50-160	10-20	50-150	60-120
3/32”	135-235	15-30	130-250	100-180
1/8”	250-400	25-40	225-360	160-250
5/32”	400-500	40-55	300-450	200-320
3/16”	500-750	55-80	400-500	290-390
1/4”	750-1000	80-125	600-800	340-525
Pure Tungsten (Green Band)				
.010”	Up to 15	*	Up to 15	Up to 10
.020”	5-20	*	5-20	10-20
.040”	15-80	*	10-60	20-30
1/16”	70-150	10-20	50-100	30-80
3/32”	125-225	15-30	100-160	60-130
1/8”	225-360	25-40	150-210	100-180
5/32”	360-450	40-55	200-275	160-240
3/16”	450-720	55-80	250-350	190-300
1/4”	720-950	80-125	325-450	250-400
Zirconium Alloyed Tungsten (Brown Band)				
.010”	*	*	Up to 20	Up to 15
.020”	*	*	15-35	5-20
.040”	*	*	20-80	20-60
1/16”	*	*	50-150	60-120
3/32”	*	*	130-250	100-180
1/8”	*	*	225-360	160-250
5/32”	*	*	300-450	200-320
3/16”	*	*	400-550	290-390
1/4”	*	*	600-800	340-525

♦ Typical argon shielding gas flow rates are 15 to 35 cfh (cubic feet per hour). *Not Recommended.

Figures listed are a guide and are a composite of recommendations from American Welding Society (AWS) and electrode manufacturers.

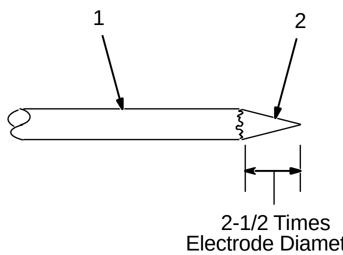
Return To Table Of Contents

9-2. Preparing Tungsten Electrode For Welding



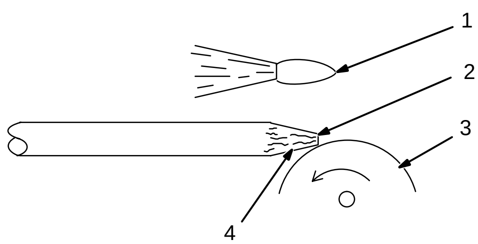
▲ **Grinding the tungsten electrode produces dust and flying sparks which can cause injury and start fires. Use local exhaust (forced ventilation) at the grinder or wear an approved respirator. Read MSDS for safety information. Consider using tungsten containing ceria, lanthana, or yttria instead of thoria. Grinding dust from thoriated electrodes contains low-level radioactive material. Properly dispose of grinder dust in an environmentally safe way. Wear proper face, hand, and body protection. Keep flammables away.**

A. Preparing Tungsten For DC Electrode Negative (DCEN) Welding Or AC Welding With Inverter Machines



1 Tungsten Electrode
2 Tapered End

Grind end of tungsten on fine grit, hard abrasive wheel before welding. Do not use wheel for other jobs or tungsten can become contaminated causing lower weld quality.



Ideal Tungsten Preparation − Stable Arc

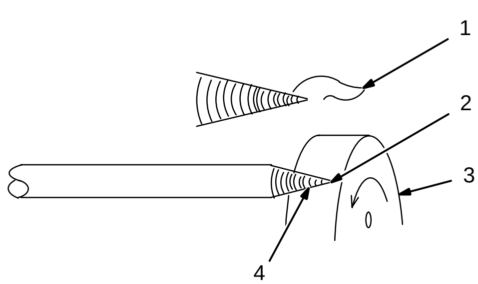
1 Stable Arc
2 Flat

Diameter of this flat determines amperage capacity.

3 Grinding Wheel

Grinding wheel should be dedicated to grinding tungsten only.

4 Straight Ground



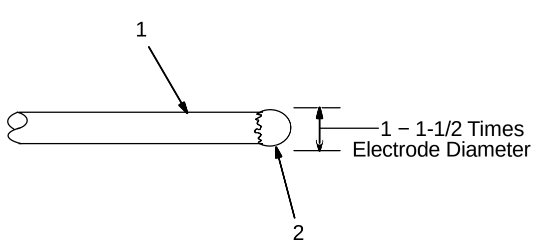
Wrong Tungsten Preparation − Wandering Arc

1 Arc Wander
2 Point
3 Grinding Wheel

Grinding wheel should be dedicated to grinding tungsten only.

4 Radial Ground

B. Preparing Tungsten For Conventional AC Welding



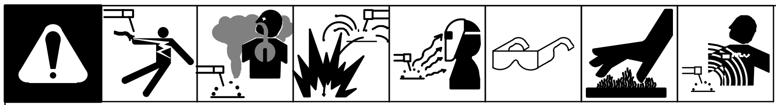
1 Tungsten Electrode
2 Balled End

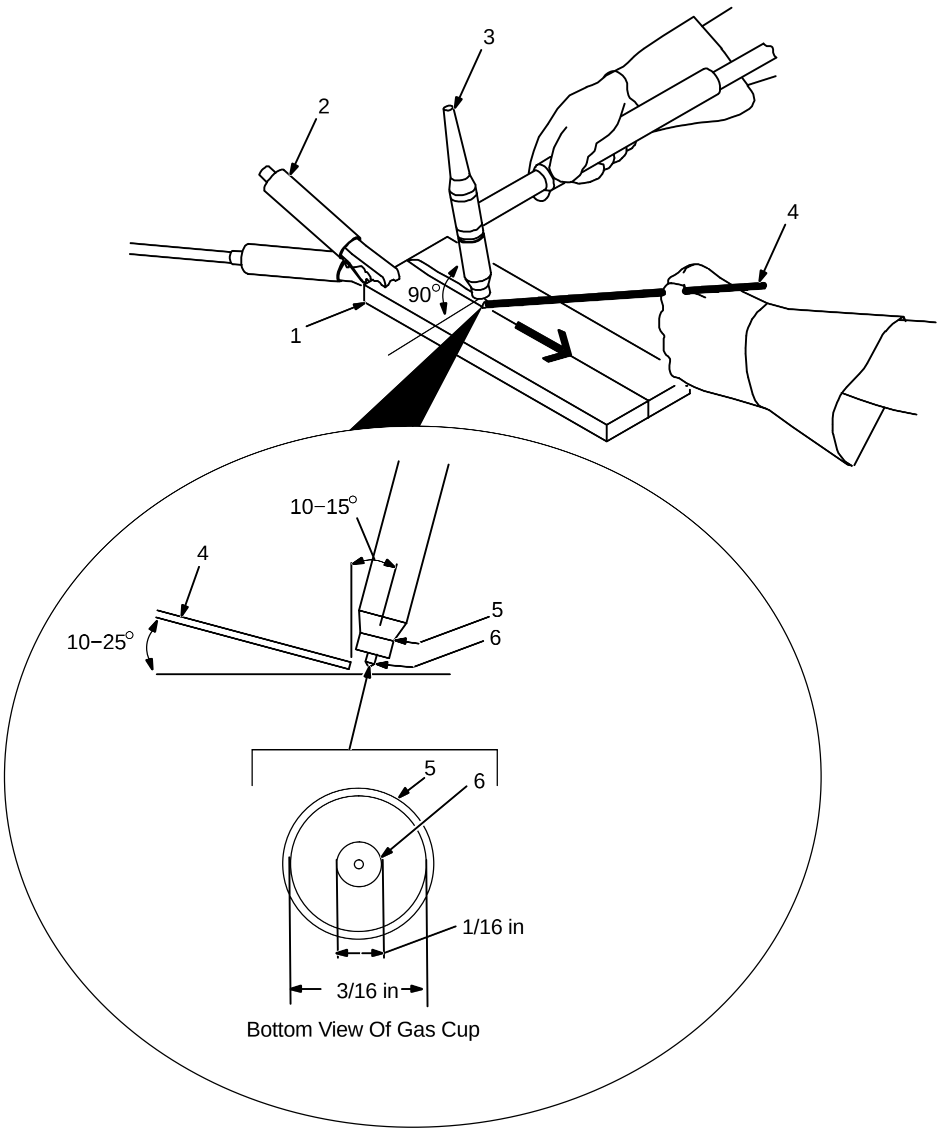
▲ **Understand and follow safety symbols at start of Section 10-1 before preparing tungsten.**

Ball end of tungsten by applying AC amperage recommended for a given electrode diameter (see Section 9-1). Let ball on end of the tungsten take its own shape.

SECTION 10 − GUIDELINES FOR TIG WELDING (GTAW)

10-1. Positioning The Torch





▲ **Weld current can damage electronic parts in vehicles. Disconnect both battery cables before welding on a vehicle. Place work clamp as close to the weld as possible.**

☞ *For additional information, see your distributor for a handbook on the Gas Tungsten Arc Welding (GTAW) process.*

1 Workpiece

Make sure workpiece is clean before welding.

2 Work Clamp

Place as close to the weld as possible.

3 Torch

4 Filler Rod (If Applicable)

5 Gas Cup

6 Tungsten Electrode

Select and prepare tungsten according to Sections 9-1 and 9-2.

Guidelines:

The inside diameter of the gas cup should be at least three times the tungsten diameter to provide adequate shielding gas coverage. (For example, if tungsten is 1/16 in diameter, gas cup should be a minimum of 3/16 in diameter.

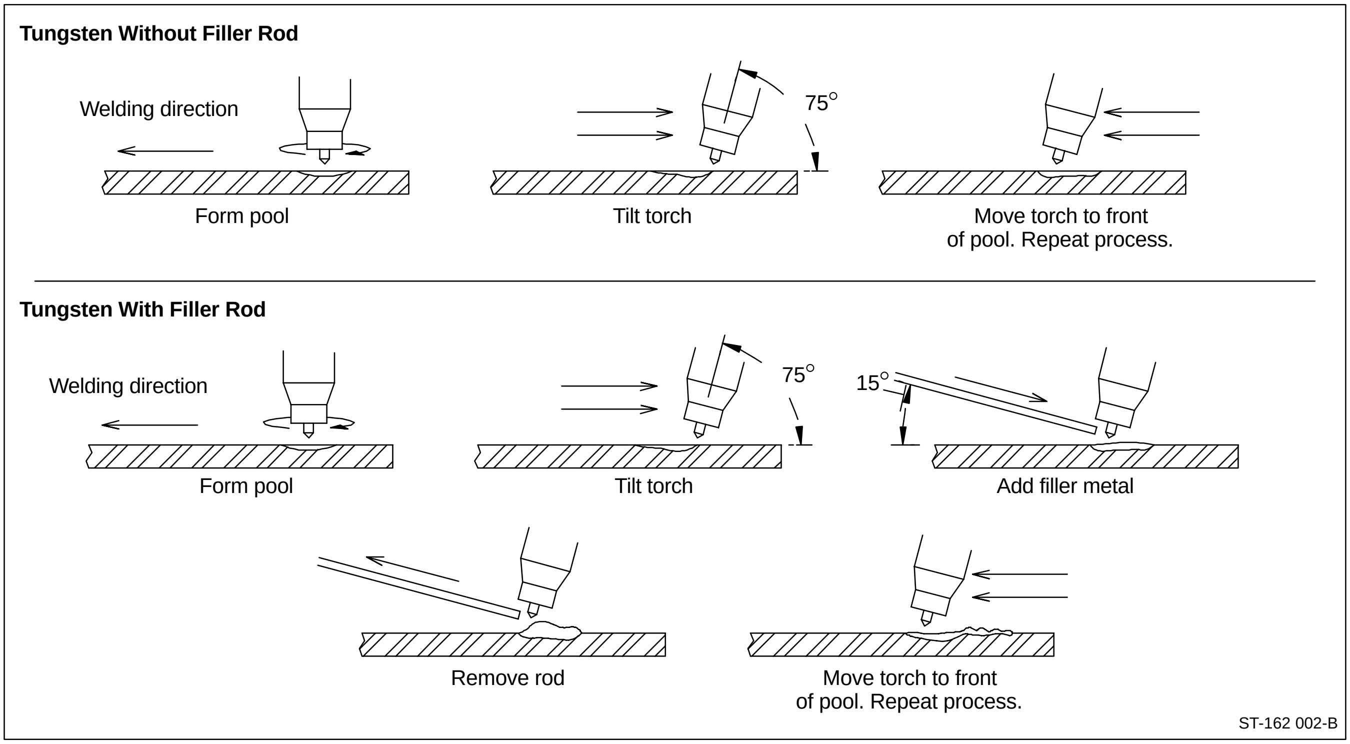
Tungsten extension is the distance the tungsten extends out gas cup of torch.

The tungsten extension should be no greater than the inside diameter of the gas cup.

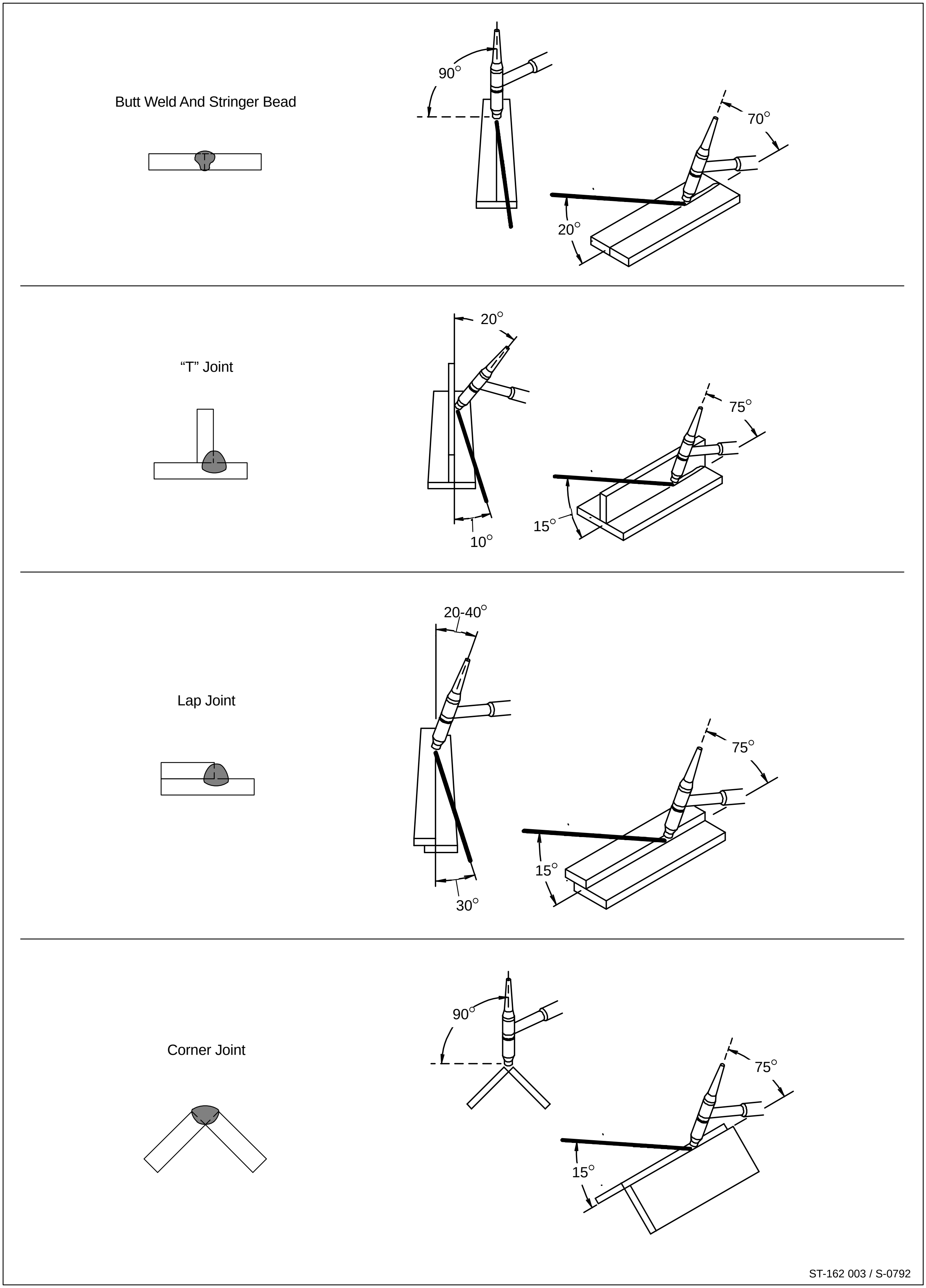
Arc length is the distance from the tungsten to the workpiece.

Ref. ST-161 892

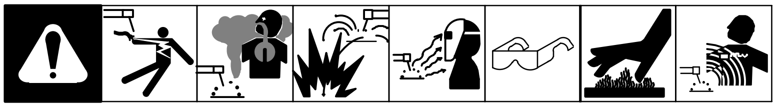
10-2. Torch Movement During Welding



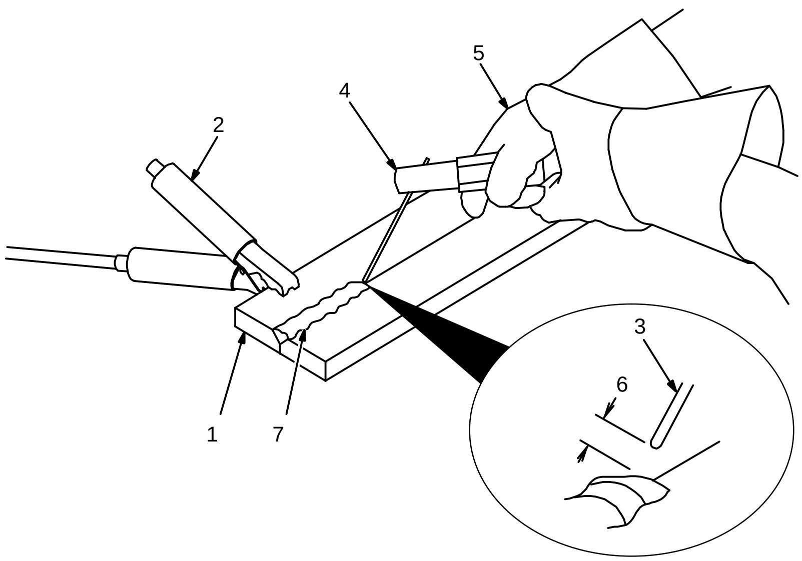
10-3. Positioning Torch Tungsten For Various Weld Joints



SECTION 11 − STICK WELDING (SMAW) GUIDELINES



11-1. Stick Welding Procedure



▲ **Weld current starts when electrode touches workpiece.**

▲ **Weld current can damage electronic parts in vehicles. Disconnect both battery cables before welding on a vehicle. Place work clamp as close to the weld as possible.**

1 Workpiece

Make sure workpiece is clean before welding.

2 Work Clamp

3 Electrode

A small diameter electrode requires less current than a large one. Follow electrode manufacturer's instructions when setting weld amperage (see Section 11-2).

4 Insulated Electrode Holder

5 Electrode Holder Position

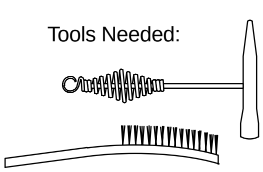
6 Arc Length

Arc length is the distance from the electrode to the workpiece. A short arc with correct amperage will give a sharp, crackling sound.

7 Slag

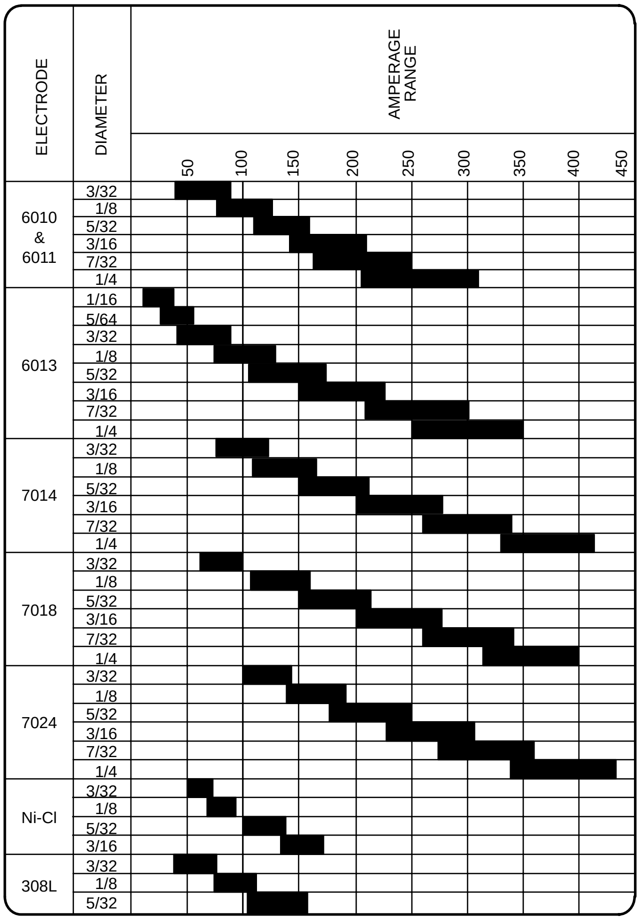
Use a chipping hammer and wire brush to remove slag. Remove slag and check weld bead before making another weld pass.

Tools Needed:



stick 12/96 − ST-151 593

11-2. Electrode and Amperage Selection Chart

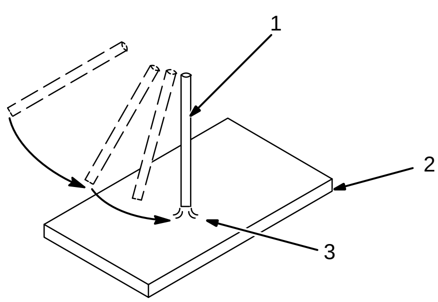


ELECTRODE	DC*	AC	POSITION	PENETRATION	USAGE
6010	EP		ALL	DEEP	MIN. PREP, ROUGH HIGH SPATTER
6011	EP	✓	ALL	DEEP	
6013	EP,EN	✓	ALL	LOW	GENERAL
7014	EP,EN	✓	ALL	MED	SMOOTH, EASY, FAST
7018	EP	✓	ALL	LOW	LOW HYDROGEN, STRONG
7024	EP,EN	✓	FLAT HORIZ FILLET	LOW	SMOOTH, EASY, FASTER
NI-CL	EP	✓	ALL	LOW	CAST IRON
308L	EP	✓	ALL	LOW	STAINLESS

*EP = ELECTRODE POSITIVE (REVERSE POLARITY)
EN = ELECTRODE NEGATIVE (STRAIGHT POLARITY)

Ref. S-087 985-A

11-3. Striking an Arc − Scratch Start Technique

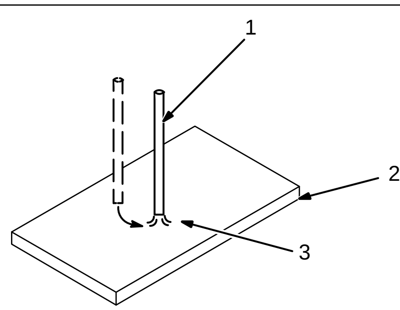


1 Electrode
2 Workpiece
3 Arc

Drag electrode across workpiece like striking a match; lift electrode slightly after touching work. If arc goes out electrode was lifted to high. If electrode sticks to workpiece, use a quick twist to free it.

S-0049

11-4. Striking an Arc − Tapping Technique

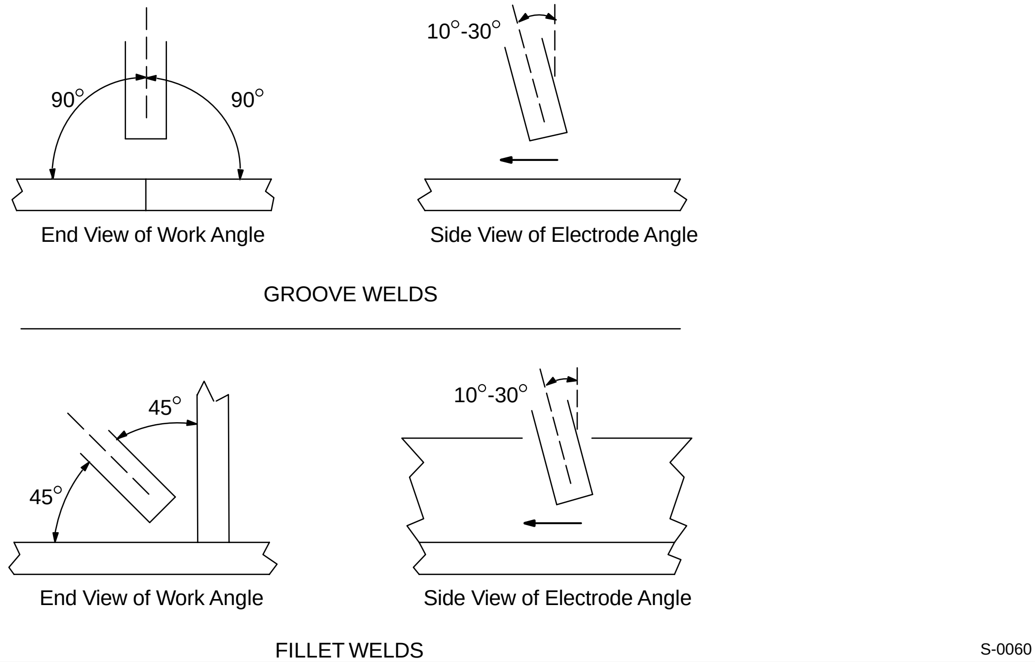


1 Electrode
2 Workpiece
3 Arc

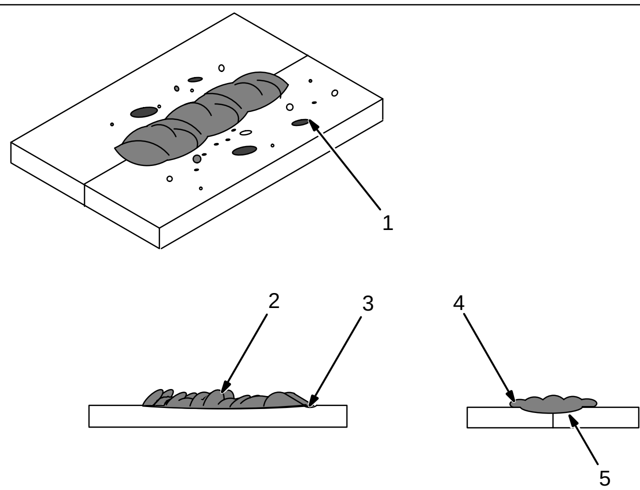
Bring electrode straight down to workpiece; then lift slightly to start arc. If arc goes out, electrode was lifted too high. If electrode sticks to workpiece, use a quick twist to free it.

S-0050

11-5. Positioning Electrode Holder

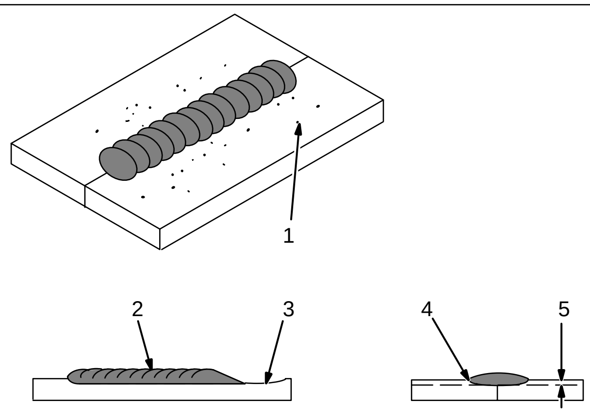


11-6. Poor Weld Bead Characteristics



1 Large Spatter Deposits
2 Rough, Uneven Bead
3 Slight Crater During Welding
4 Bad Overlap
5 Poor Penetration

11-7. Good Weld Bead Characteristics



1 Fine Spatter
2 Uniform Bead
3 Moderate Crater During Welding

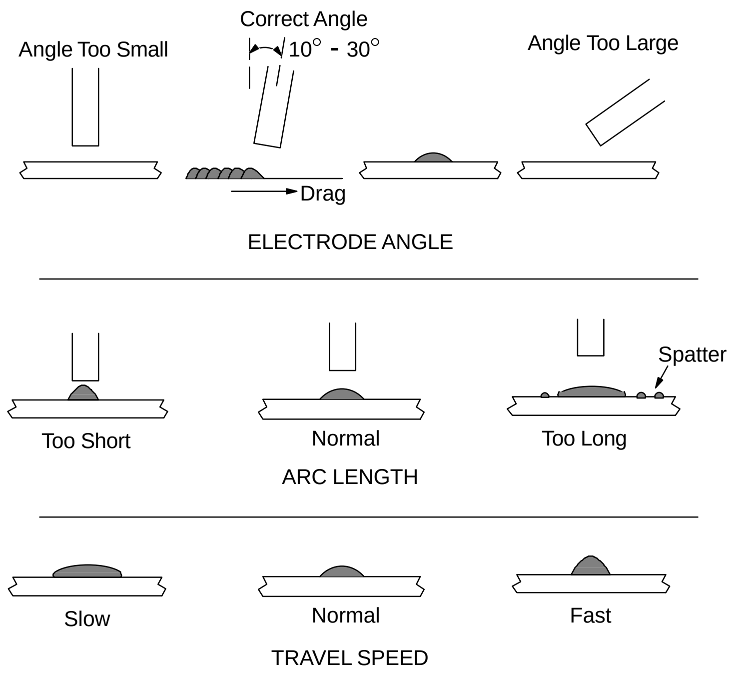
Weld a new bead or layer for each 1/8 in. (3.2 mm) thickness in metals being welded.

4 No Overlap
5 Good Penetration into Base Metal

11-8. Conditions That Affect Weld Bead Shape

NOTE

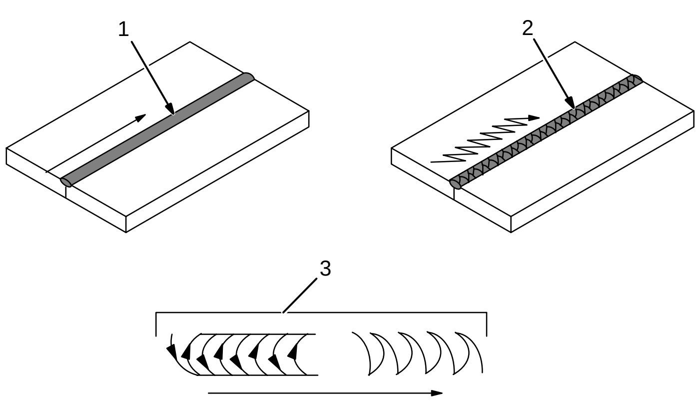
Weld bead shape is affected by electrode angle, arc length, travel speed, and thickness of base metal.



11-9. Electrode Movement During Welding

NOTE

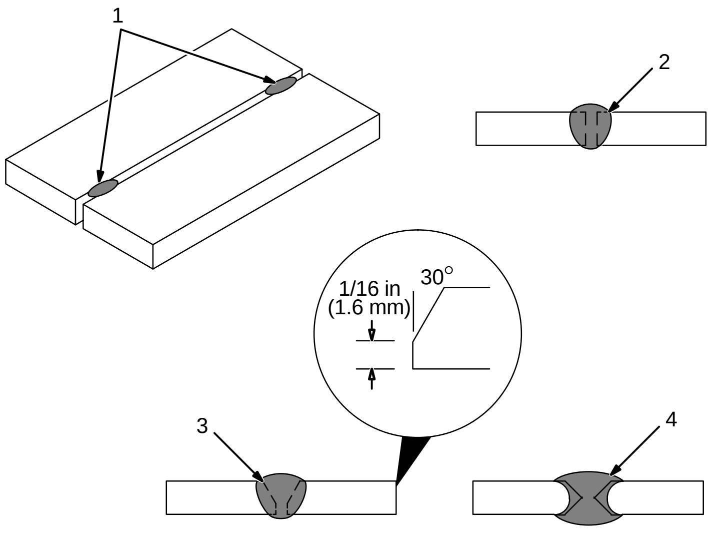
Normally, a single stringer bead is satisfactory for most narrow groove weld joints; however, for wide groove weld joints or bridging across gaps, a weave bead or multiple stringer beads work better.



1 Stringer Bead − Steady Movement Along Seam
2 Weave Bead − Side to Side Movement Along Seam
3 Weave Patterns

Use weave patterns to cover a wide area in one pass of the electrode. Do not let weave width exceed 2-1/2 times diameter of electrode.

11-10. Butt Joints



1 Tack Welds

Prevent edges of joint from drawing together ahead of electrode by tack welding the materials in position before final weld.

2 Square Groove Weld

Good for materials up to 3/16 in (5 mm) thick.

3 Single V-Groove Weld

Good for materials 3/16 − 3/4 in (5-19 mm) thick. Cut bevel with oxy-acetylene or plasma cutting equipment. Remove scale from material after cutting. A grinder can also be used to prepare bevels.

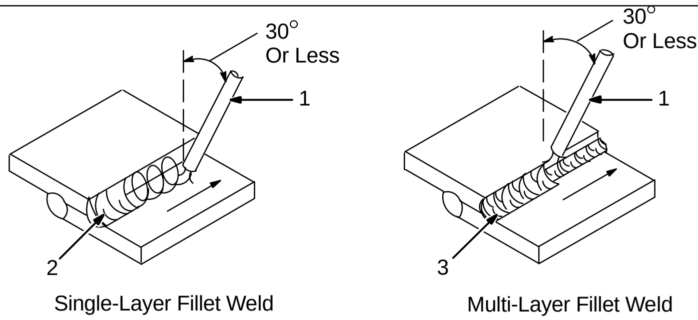
Create 30 degree angle of bevel on materials in V-groove welding.

4 Double V-Groove Weld

Good for materials thicker than 3/16 in (5 mm).

S-0662

11-11. Lap Joint



1 Electrode

2 Single-Layer Fillet Weld

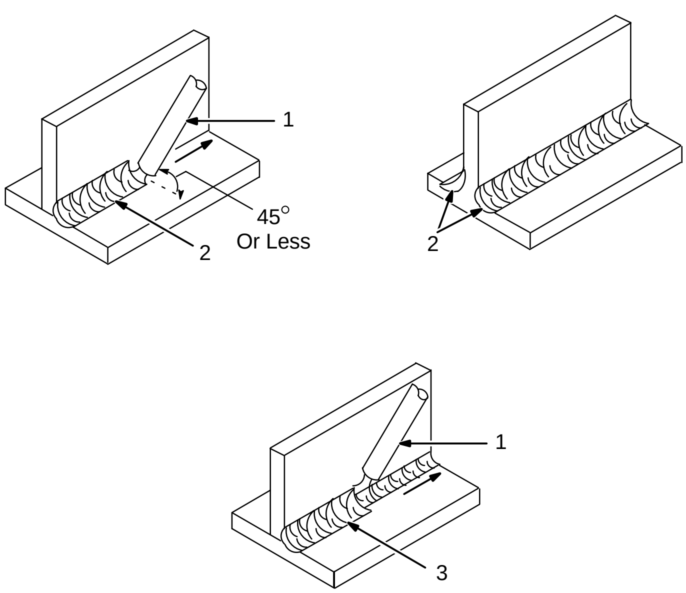
Move electrode in circular motion.

3 Multi-Layer Fillet Weld

Weld a second layer when a heavier fillet is needed. Remove slag before making another weld pass. Weld both sides of joint for maximum strength.

S-0063 / S-0064

11-12. Tee Joint



1 Electrode

2 Fillet Weld

Keep arc short and move at definite rate of speed. Hold electrode as shown to provide fusion into the corner. Square edge of the weld surface.

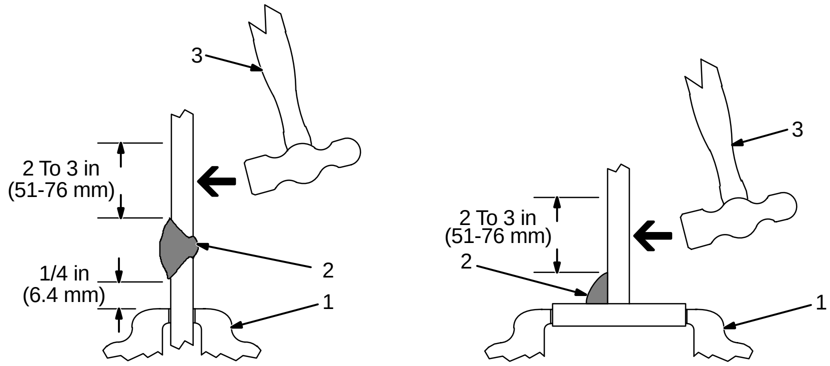
For maximum strength weld both sides of upright section.

3 Multi-Layer Deposits

Weld a second layer when a heavier fillet is needed. Use any of the weaving patterns shown in Section 11-9. Remove slag before making another weld pass.

S-0060 / S-0058-A / S-0061

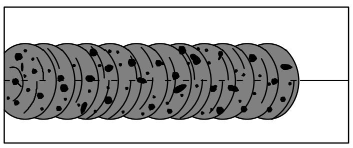
11-13. Weld Test



1 Vise
2 Weld Joint
3 Hammer

Strike weld joint in direction shown. A good weld bends over but does not break.

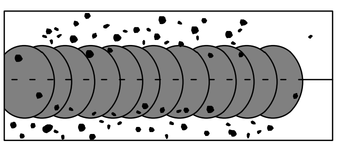
11-14. Troubleshooting − Porosity



Porosity − small cavities or holes resulting from gas pockets in weld metal.

Possible Causes	Corrective Actions
Arc length too long.	Reduce arc length.
Damp electrode.	Use dry electrode.
Workpiece dirty.	Remove all grease, oil, moisture, rust, paint, coatings, slag, and dirt from work surface before welding.

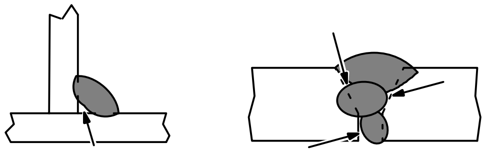
11-15. Troubleshooting − Excessive Spatter



Excessive Spatter − scattering of molten metal particles that cool to solid form near weld bead.

Possible Causes	Corrective Actions
Amperage too high for electrode.	Decrease amperage or select larger electrode.
Arc length too long or voltage too high.	Reduce arc length or voltage.

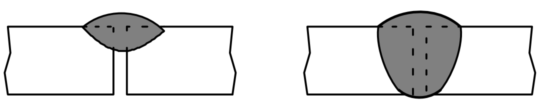
11-16. Troubleshooting − Incomplete Fusion



Incomplete Fusion − failure of weld metal to fuse completely with base metal or a preceeding weld bead.

Possible Causes	Corrective Actions
Insufficient heat input.	Increase amperage. Select larger electrode and increase amperage.
Improper welding technique.	Place stringer bead in proper location(s) at joint during welding.
	Adjust work angle or widen groove to access bottom during welding.
	Momentarily hold arc on groove side walls when using weaving technique.
	Keep arc on leading edge of weld puddle.
Workpiece dirty.	Remove all grease, oil, moisture, rust, paint, coatings, slag, and dirt from work surface before welding.

11-17. Troubleshooting − Lack Of Penetration

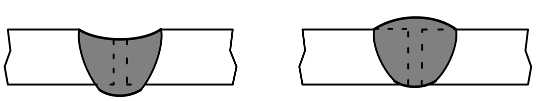


Lack of Penetration   Good Penetration

Lack Of Penetration − shallow fusion between weld metal and base metal.

Possible Causes	Corrective Actions
Improper joint preparation.	Material too thick. Joint preparation and design must provide access to bottom of groove.
Improper weld technique.	Keep arc on leading edge of weld puddle.
Insufficient heat input.	Increase amperage. Select larger electrode and increase amperage.
	Reduce travel speed.

11-18. Troubleshooting − Excessive Penetration

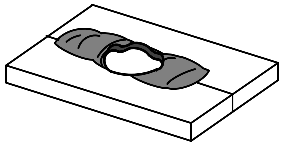


Excessive Penetration   Good Penetration

Excessive Penetration − weld metal melting through base metal and hanging underneath weld.

Possible Causes	Corrective Actions
Excessive heat input.	Select lower amperage. Use smaller electrode.
	Increase and/or maintain steady travel speed.

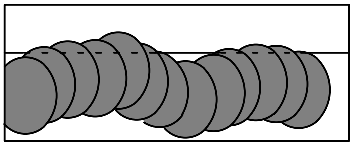
11-19. Troubleshooting − Burn-Through



Burn-Through − weld metal melting completely through base metal resulting in holes where no metal remains.

Possible Causes	Corrective Actions
Excessive heat input.	Select lower amperage. Use smaller electrode.
	Increase and/or maintain steady travel speed.

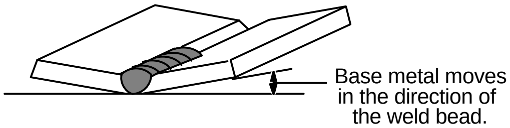
11-20. Troubleshooting − Waviness Of Bead



Waviness Of Bead − weld metal that is not parallel and does not cover joint formed by base metal.

Possible Causes	Corrective Actions
Unsteady hand.	Use two hands. Practice technique.

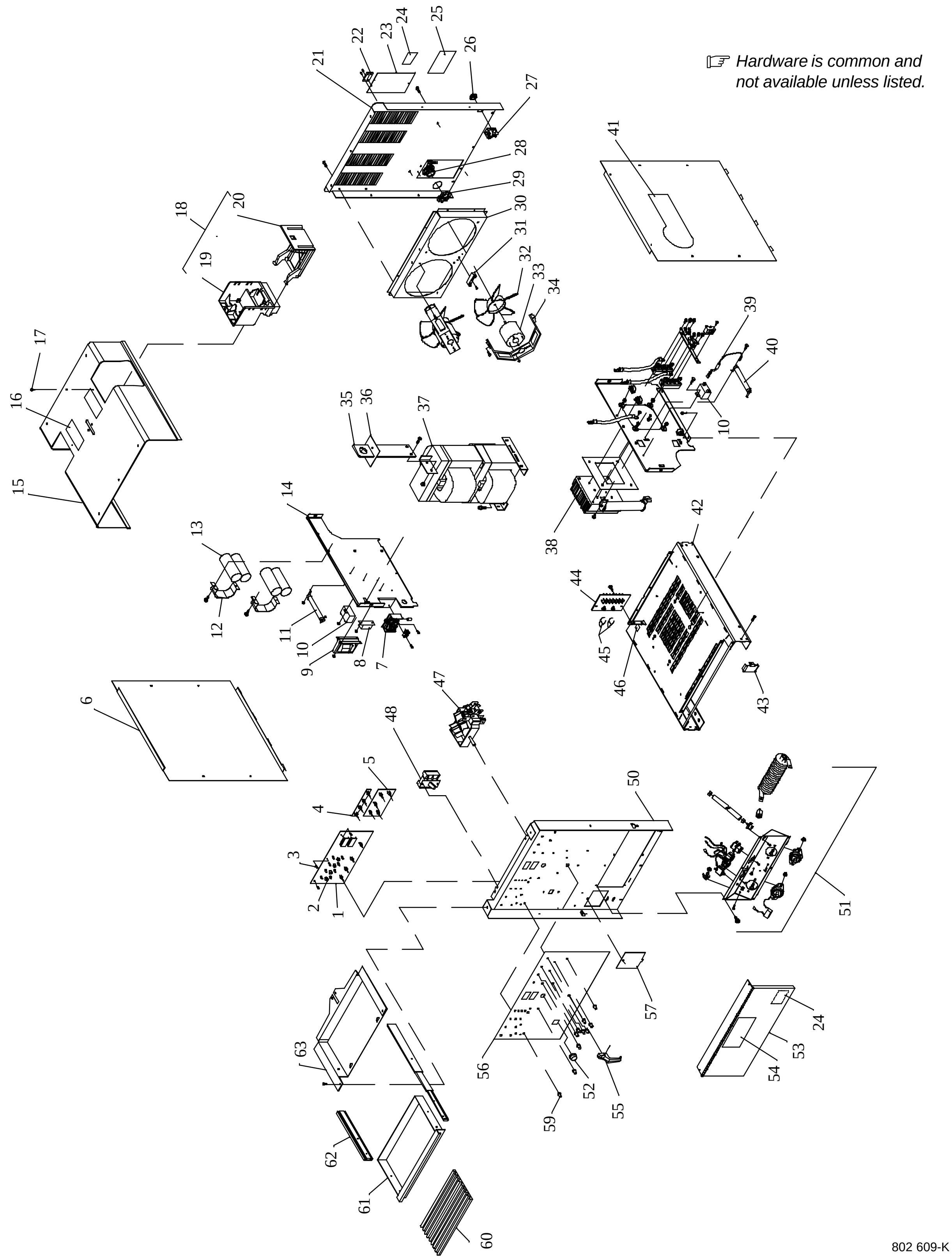
11-21. Troubleshooting − Distortion



Distortion − contraction of weld metal during welding that forces base metal to move.

Possible Causes	Corrective Actions
Excessive heat input.	Use restraint (clamp) to hold base metal in position.
	Make tack welds along joint before starting welding operation.
	Select lower amperage for electrode.
	Increase travel speed.
	Weld in small segments and allow cooling between welds.

SECTION 12 − PARTS LIST



802 609-K

Figure 12-1. Main Assembly

Item No.	Dia. Mkgs.	Part No.	Description	Quantity

Figure 12-1. Main Assembly

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
1	PC1	203 899	Circuit Card Assy, Interface (consisting of)	1
	PLG13, 15	131 054	Connector W/Sockets	2
	PLG10	130 203	Connector W/Sockets	1
	PLG14	115 092	Connector W/Sockets	1
	PLG4	115 093	Connector W/Sockets	1
	PLG17	131 052	Connector W/Sockets	1
	PLG16	115 091	Connector W/Sockets	1
2		195 778	Actuator Push Button Assy	4
3		190 512	Stand−off, No 6−32 X .6406 Lg	4
4	PC2	♦190 734	Circuit Card, Pulser	1
5	PC3	♦190 738	Circuit Card, Sequencer	1
6		207 562	Panel, Side	2
7	G1	199 854	Spark Gap Assy, (consisting of)	1
		199 855	Base	1
		199 856	Holder, Points	4
		196 455	Points, Spark Gap	4
8	C3	096 761	Capacitor, Mica .002 UF 10,000 V Panel Mtg	1
9	T3	208 045	Xfmr, High Voltage 115v Pri 3600v Sec 30 Ma w/Term	1
10	C11, C19	195 552	Capacitor, Polyp Met Film 20. Uf 250 Vac 10%	2
11	R8	188 067	Resistor, ww fxd 100 w 200 ohm w/clips	1
12		♦129 201	Bracket, mtg capacitor	2
13	C20-23	♦203 517	Capacitor, polyp film 150 uf 250 VAC can 10%	4
14		207 574	Panel, Left Wind Tunnel	1
15		205 726	Top, Cover	1
16		201 019	Label, Warning electric shock excess weight	2
17		494 907	Screw, k50 x 20 pan hd − trx pld pt thread forming	2
18		204 389	Holder, Torch/Cable (consisting of)	2
19		200 920	Door, Torch/Cable Holder	2
20		200 922	Housing, Torch/Cable Holder	2
21		+207 563	Panel, Rear	1
22		168 343	Hinge, Cont Polyolefin Copolymer 2.000 L W/.125h	1
23		184 057	Door, Primary Board	1
		189 491	Spacer, Hinge	1
24		127 363	Label, Warning Electric Shock Can Kill	1
25		168 384	Label, Warning Electric Shock And Incorrect Input P	1
26		137 761	Nut, 750NPT 1.31HEX .27H NYL BLK	1
27	GS1	216 607	Valve, 24VDC 2WAY CUSTOM PORT 1/8 ORF W/FRICT	1
		602 969	Plug, Protective No 6 Plastic	2
28		010 146	Clamp, Nyl .625 Clamp Dia X.500 Wide .203 Mtg Hole	1
29		176 272	Conn, Clamp Cable	1
30		184 058	Fan, Plenum	1
31	1T	199 312	Block, Terminal Fast−on	1
32		150 783	Blade, Fan 9.000 5wg 39deg .312 Bore Cw Plstc	2
33	FM1, FM2	188 706	Motor, Fan 230v 50/60hz 1550 Rpm .312 Dia Shaft	2
34		187 807	Bracket, Mtg Motor Fan	2
35		204 293	Support, Lift Eye	1
36		026 627	Gasket, Lifting Eye Cover	1
37	T1, Z1	207 607	Xfmr/Stabilizer Assy, 200/230/460	1
37	T1, Z1	207 710	Xfmr/Stabilizer Assy, 230/460/575	1
37	T1, Z1	207 711	Xfmr/Stabilizer Assy, 220/400/440/520	1
	TH1	201 443	Thermistor, NTC 10k ohm @ 25 deg C 27.5 in lead	1
	PLG1	202 119	Connector W/Sockets	1
	PLG7	202 116	Connector W/Sockets	1
	PLG8	202 117	Connector W/Sockets	1
	PLG11	202 118	Connector W/Sockets	1
38	SR1	207 611	Rectifier Assy, (Figure 12-3)	1
39	R2	189 132	Resistor Assy,	1
40	R1	186 468	Resistor, Ww Fxd 100 W 50 Ohm W/Clips	1
41		194 590	Label, Miller 12.563 X 5.376 Horizontal Syncrowav	2
42		+207 559	Base	1
43		207 571	End Cap	4

Item No.	Dia. Mkgs.	Part No.	Description	Quantity

Figure 12-1. Main Assembly (continued)

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
44	TE1	202 790	Term Assy, Pri 1ph 3v (consisting of)	1
		083 426	Terminal Board, pri	1
		038 618	Link, jumper term bd pri	2
		601 835	Nut, brs hex 10-32reg	12
		601 836	Nut, brs hex .250-20 jam hvy	4
		038 888	Stud, pri board brs .250-20 x 1.500	2
		038 887	Stud, pri board brs 10-32 x 1.375	6
		010 913	Washer, flat brs .187 ID	6
		010 915	Washer, flat brs .250 ID x .625 OD x .031thk	4
		602 207	Washer, lock .255 ID x .489 OD	2
		175 479	Link, jumper	1
		213 248	Lug, Univ W/Screw 2/O−14 Wire .266std	1
45	C5, C6	111 634	Capacitor Assy	1
46		155 436	Label, Ground/Protectiv	1
47	S5	207 236	Switch, Polarity/Changeover (DX)	1
48	S1	128 757	Switch, Tgl Dpst 60a 600vac Scr Term Wide Tgl	1
50		212 245	Panel, Front	1
		143 397	Blank, Snap−in Nyl .312 Mtg Hole Black	8
		117 860	Blank, Snap−in Nyl .187 Mtg Hole Black	1
		107 983	Blank, Snap−in Nyl .500 Mtg Hole Black	1
51		207 612	HF Panel Assy, Lower (Figure 12-2)	1
52		174 991	Knob, Pointer 1.250 Dia X .250 Id W/Spring Clip−.21	1
53		+196 492	Door, Access Front	1
54		203 990	Label, Warning General Precautionary Static&wire Fe	1
55		175 952	Plastic, Handle Switch	1
56		204 776	Nameplate, Miller Syncrowave 250DX	1
56		208 242	Nameplate, Miller Syncrowave 250DX (Wordless)	1
57		207 572	Door Spark Gap Access	1
59		183 332	Knob, Pointer .570 Dia X .125 Id W/Spring Clip	3
60		204 416	Drawer, Mat	1
61		204 314	Drawer	1
62		216 593	Slide, Drawer	2
63		204 313	Drawer, tray	1

♦ OPTIONAL

+When ordering a component originally displaying a precautionary label, the label should also be ordered.

To maintain the factory original performance of your equipment, use only Manufacturer's Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
		207 612	**Figure 12-2. HF Panel Assembly, Lower (Figure 12-1 Item 51)**	
1		213 217	Panel, Lower Hf	1
2		208 294	Connector, Faston Male 4-Prong	1
3	RC2/CB1/C12	207 617	Receptacle, W/Leads And Circuit Breaker	1
		156 734	Nut, 010−32 .31hex .13h Stl Pld Sem Cone Wshr.38d	1
4	RC1	211 911	Conn, circ ms/cpc 14 skt size 20 rcpt w/filtering	1
	PLG5	143 976	Connector W/Sockets	1
6		089 120	Clamp, Hose .375 − .450 Clp Dia Slfttng Green	2
7		155 527	Hose, Nprn Brd No 1 X .250 Id X 28.000	1
8		208 408	Ftg, Gas	1
9		207 560	Insulator, Standoff W/Stud	1
10	T4	212 251	Coil, Hf Coupling	1
		203 474	Service Kit, DX Coupling Coil	1
11	C13, C14	206 878	Capacitor Assy,	2
12		039 047	Terminal, Pwr Output Red	2

To maintain the factory original performance of your equipment, use only Manufacturer’s Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.

☞ *Hardware is common and not available unless listed.*

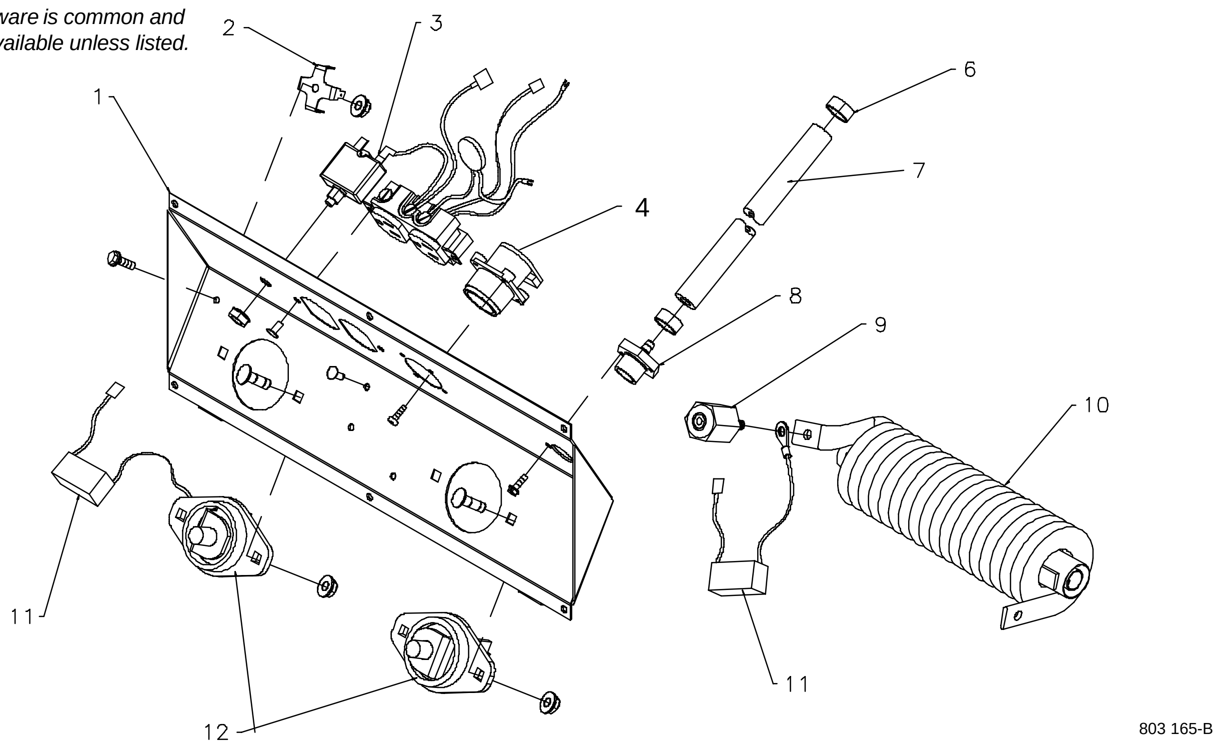


Figure 12-2. HF Panel Assembly, Lower

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
		207 611	**Figure 12-3. HF Rectifier Assembly (Figure 12-1 Item 38)**	
1		206 984	Heat Sink, Rectifier	1
2		207 558	Insulator, Rectifier	1
3		196 355	Insulator, Screw	4
4		211 441	Clip, Snap In	3
5		207 575	Panel, Right Windtunnel	1
6		199 962	Bus Bar	1
7	C7, 8, 9, 10	190 460	Capacitor Assy	2
8	HD1	191 941	Transducer, Current Hall	1
9	Mod 1, 2	196 760	Thyristor, SCR Module	2
10	TH2	206 327	Thermister, NTC 30K Ohm @ 25 deg C	1
11	R3	211 440	Resistor, WW Fxd 400 W 35 Ohm W/Mtg Bkt	1

To maintain the factory original performance of your equipment, use only Manufacturer's Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.

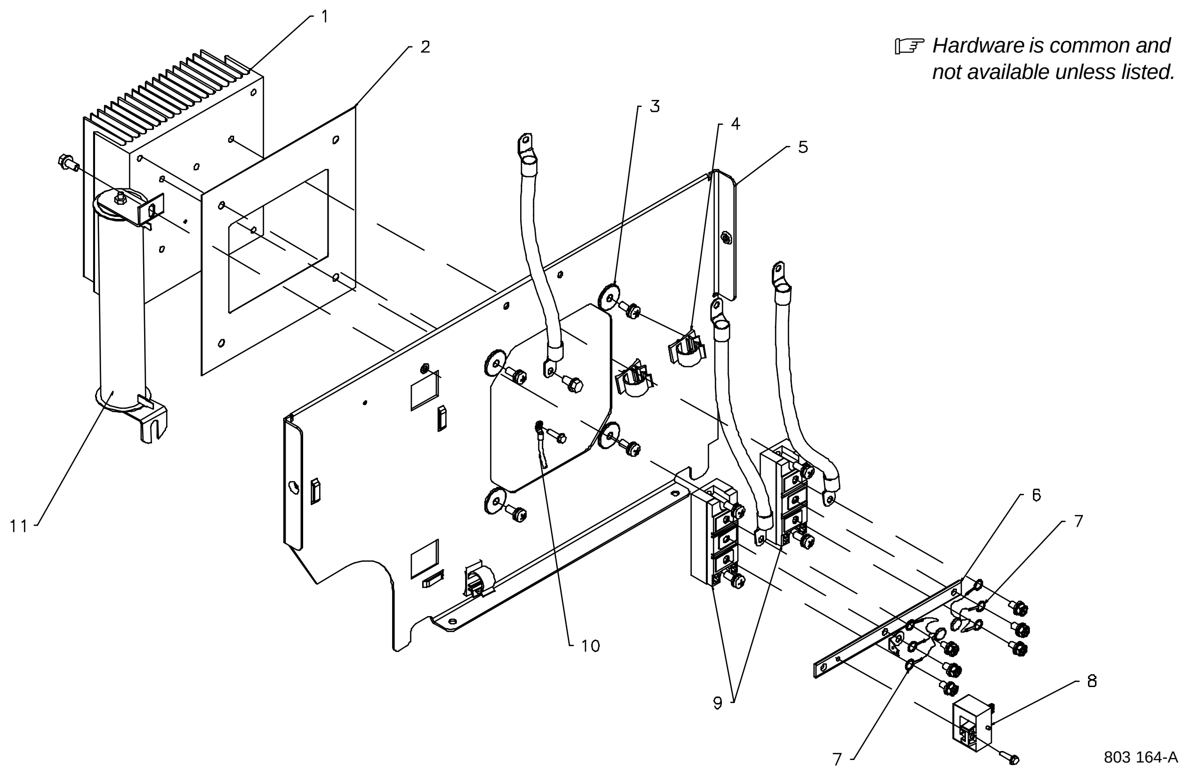


Figure 12-3. Rectifier Assembly

Warranty Questions?

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for your local
Miller distributor.

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Service
You always get the fast, reliable response you need. Most replacement parts can be in your hands in 24 hours.

Support
Need fast answers to the tough welding questions? Contact your distributor. The expertise of the distributor and Miller is there to help you, every step of the way.

Miller®

TRUE BLUE® WARRANTY

Effective January 1, 2003
(Equipment with a serial number preface of "LC" or newer)

This limited warranty supersedes all previous Miller warranties and is exclusive with no other guarantees or warranties expressed or implied.

LIMITED WARRANTY − Subject to the terms and conditions below, Miller Electric Mfg. Co., Appleton, Wisconsin, warrants to its original retail purchaser that new Miller equipment sold after the effective date of this limited warranty is free of defects in material and workmanship at the time it is shipped by Miller. THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS.

Within the warranty periods listed below, Miller will repair or replace any warranted parts or components that fail due to such defects in material or workmanship. Miller must be notified in writing within thirty (30) days of such defect or failure, at which time Miller will provide instructions on the warranty claim procedures to be followed.

Miller shall honor warranty claims on warranted equipment listed below in the event of such a failure within the warranty time periods. All warranty time periods start on the date that the equipment was delivered to the original retail purchaser, or one year after the equipment is sent to a North American distributor or eighteen months after the equipment is sent to an International distributor.

1. 5 Years Parts — 3 Years Labor
   * Original main power rectifiers
   * Inverters (input and output rectifiers only)
2. 3 Years — Parts and Labor
   * Transformer/Rectifier Power Sources
   * Plasma Arc Cutting Power Sources
   * Semi-Automatic and Automatic Wire Feeders
   * Inverter Power Supplies
   * Intellitig
   * Maxstar 150
   * Engine Driven Welding Generators **(NOTE: Engines are warranted separately by the engine manufacturer.)**
3. 1 Year — Parts and Labor Unless Specified
   * DS-2 Wire Feeder
   * Motor Driven Guns (w/exception of Spoolmate Spoolguns)
   * Process Controllers
   * Positioners and Controllers
   * Automatic Motion Devices
   * RFCS Foot Controls
   * Induction Heating Power Sources
   * Water Coolant Systems
   * Flowgauge and Flowmeter Regulators (No Labor)
   * HF Units
   * Grids
   * Maxstar 85, 140
   * Spot Welders
   * Load Banks
   * Racks
   * Running Gear/Trailers
   * Plasma Cutting Torches (except APT & SAF Models)
   * Field Options (NOTE: Field options are covered under True Blue® for the remaining warranty period of the product they are installed in, or for a minimum of one year — whichever is greater.)
4. 6 Months — Batteries
5. 90 Days — Parts
   * MIG Guns/TIG Torches
   * Induction Heating Coils and Blankets
   * APT & SAF Model Plasma Cutting Torches
   * Remote Controls
   * Accessory Kits
   * Replacement Parts (No labor)
   * Spoolmate Spoolguns
   * Canvas Covers

Miller's True Blue® Limited Warranty shall not apply to:

1. **Consumable components; such as contact tips, cutting nozzles, contactors, brushes, slip rings, relays or parts that fail due to normal wear. (Exception: brushes, slip rings, and relays are covered on Bobcat, Trailblazer, and Legend models.)**
2. Items furnished by Miller, but manufactured by others, such as engines or trade accessories. These items are covered by the manufacturer's warranty, if any.
3. Equipment that has been modified by any party other than Miller, or equipment that has been improperly installed, improperly operated or misused based upon industry standards, or equipment which has not had reasonable and necessary maintenance, or equipment which has been used for operation outside of the specifications for the equipment.

MILLER PRODUCTS ARE INTENDED FOR PURCHASE AND USE BY COMMERCIAL/INDUSTRIAL USERS AND PERSONS TRAINED AND EXPERIENCED IN THE USE AND MAINTENANCE OF WELDING EQUIPMENT.

In the event of a warranty claim covered by this warranty, the exclusive remedies shall be, at Miller's option: (1) repair; or (2) replacement; or, where authorized in writing by Miller in appropriate cases, (3) the reasonable cost of repair or replacement at an authorized Miller service station; or (4) payment of or credit for the purchase price (less reasonable depreciation based upon actual use) upon return of the goods at customer's risk and expense. Miller's option of repair or replacement will be F.O.B., Factory at Appleton, Wisconsin, or F.O.B. at a Miller authorized service facility as determined by Miller. Therefore no compensation or reimbursement for transportation costs of any kind will be allowed.

TO THE EXTENT PERMITTED BY LAW, THE REMEDIES PROVIDED HEREIN ARE THE SOLE AND EXCLUSIVE REMEDIES. IN NO EVENT SHALL MILLER BE LIABLE FOR DIRECT, INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES (INCLUDING LOSS OF PROFIT), WHETHER BASED ON CONTRACT, TORT OR ANY OTHER LEGAL THEORY.

ANY EXPRESS WARRANTY NOT PROVIDED HEREIN AND ANY IMPLIED WARRANTY, GUARANTY OR REPRESENTATION AS TO PERFORMANCE, AND ANY REMEDY FOR BREACH OF CONTRACT TORT OR ANY OTHER LEGAL THEORY WHICH, BUT FOR THIS PROVISION, MIGHT ARISE BY IMPLICATION, OPERATION OF LAW, CUSTOM OF TRADE OR COURSE OF DEALING, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE, WITH RESPECT TO ANY AND ALL EQUIPMENT FURNISHED BY MILLER IS EXCLUDED AND DISCLAIMED BY MILLER.

Some states in the U.S.A. do not allow limitations of how long an implied warranty lasts, or the exclusion of incidental, indirect, special or consequential damages, so the above limitation or exclusion may not apply to you. This warranty provides specific legal rights, and other rights may be available, but may vary from state to state.

In Canada, legislation in some provinces provides for certain additional warranties or remedies other than as stated herein, and to the extent that they may not be waived, the limitations and exclusions set out above may not apply. This Limited Warranty provides specific legal rights, and other rights may be available, but may vary from province to province.

Owner's Record

Please complete and retain with your personal records.

Model Name Serial/Style Number

Purchase Date (Date which equipment was delivered to original customer.)

Distributor

Address

City

State Zip

For Service

Call 1-800-4-A-Miller or see our website at www.MillerWelds.com to locate a DISTRIBUTOR or SERVICE AGENCY near you.

Always provide Model Name and Serial/Style Number.

Contact your Distributor for:	Welding Supplies and Consumables Options and Accessories Personal Safety Equipment Service and Repair Replacement Parts Training (Schools, Videos, Books) Technical Manuals (Servicing Information and Parts) Circuit Diagrams Welding Process Handbooks
Contact the Delivering Carrier to:	File a claim for loss or damage during shipment. For assistance in filing or settling claims, contact your distributor and/or equipment manufacturer's Transportation Department.

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